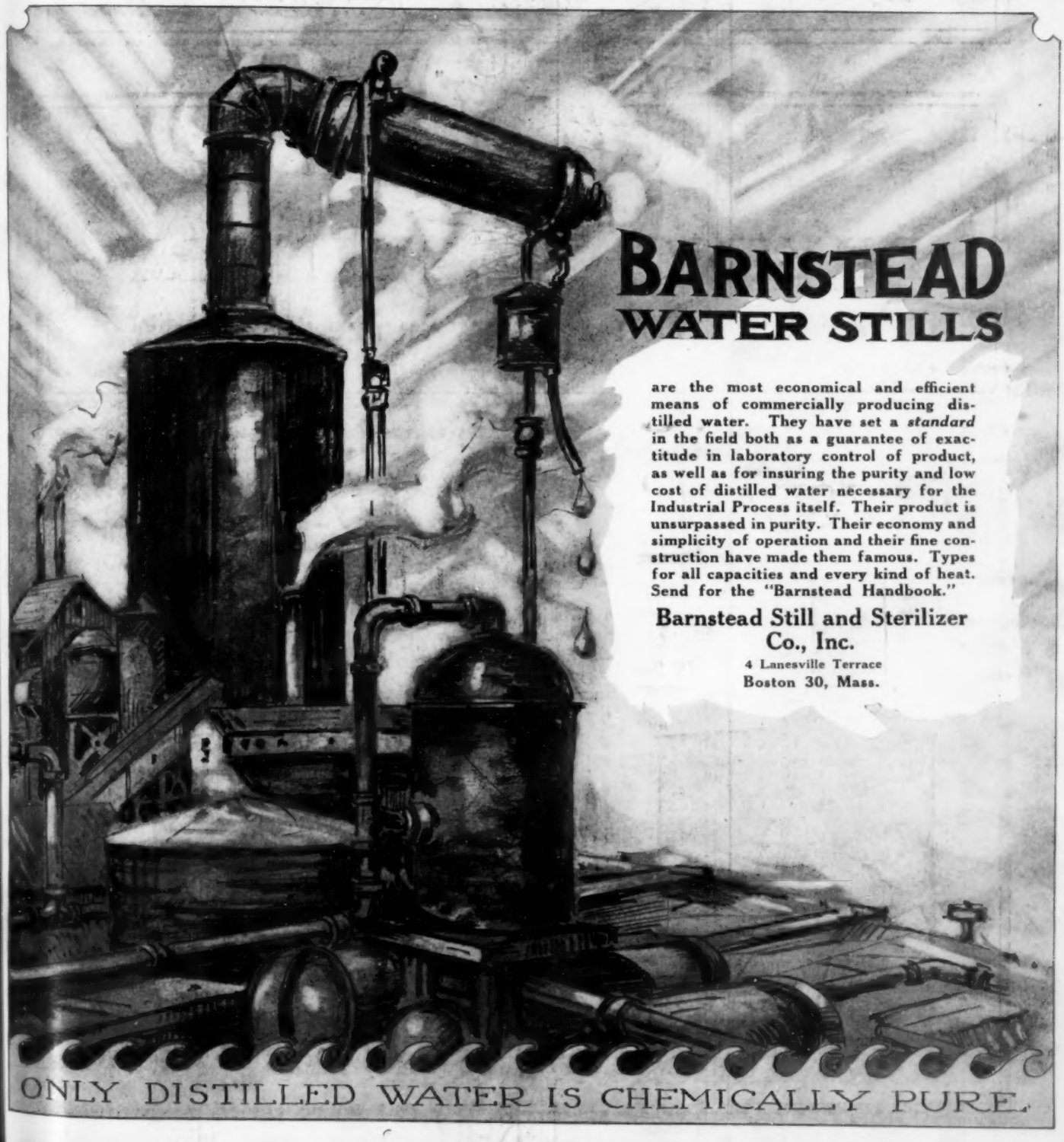
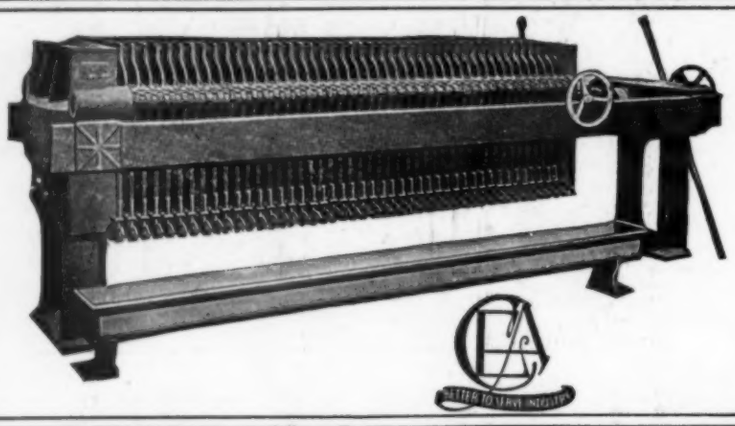
Sept. 24, 1923

McGraw-Hill Co. Inc.

25 cents per copy

CHEMICAL & METALLURGICAL ENGINEERING


BARNSTEAD
WATER STILLS
are the most economical and efficient means of commercially producing distilled water. They have set a *standard* in the field both as a guarantee of exactitude in laboratory control of product, as well as for insuring the purity and low cost of distilled water necessary for the Industrial Process itself. Their product is unsurpassed in purity. Their economy and simplicity of operation and their fine construction have made them famous. Types for all capacities and every kind of heat. Send for the "Barnstead Handbook."
Barnstead Still and Sterilizer Co., Inc.
4 Lanesville Terrace
Boston 30, Mass.
ONLY DISTILLED WATER IS CHEMICALLY PURE.



Shriver Efficiency

Many years of producing filter presses for all types of filtration work enable us to guarantee the results.

This guarantee of efficiency goes with every filter press we sell—we know our product, and we are ready to stand back of it. Write for catalog, stating your filtration problems.

T. SHRIVER & CO.

808 Hamilton Street, Harrison, N. J.

The filter cloth used is just as important as the filter press. We are in a position to supply filter paper or filter cloth especially woven for filter press work, at very close prices. *Ask us to quote on your filter cloth requirements.*

"Proctor"

DRYING MACHINERY

PROCTOR & SCHWARTZ, Inc.

PHILADELPHIA

RESEARCH APPARATUS

Freas Water Thermostat
Large Size

THE Freas Sensitive Water Thermostat — In regular use in the leading American and Canadian Universities and Colleges.

Designed to furnish continuous constant temperature from lowest temperature of water or water solution available up to 50° C. Large size is sensitive to 2/1000° C. Small size to 1/100° C. The large size has rectangular copper-lined tank of 85-gallon capacity. The small size has round inner glass tank of 10-gallon capacity. Both sizes use the standard Freas sensitive mercury regulator.

Price of the large size.....$480.00
Price of the small size..... 220.00

Write for Bulletin "Freas Water Baths and Thermostats." For other forms of Freas apparatus we refer to the following Bulletins:

Freas Conditioning Ovens; Freas Conductivity Apparatus; Freas Incubators and Sterilizers; Freas Ovens and Tube Furnaces; Freas Vacuum Ovens; Freas Steam Hot Plate; Freas Hot Water Mixer.

EIMER & AMEND

ESTABLISHED 1851

Headquarters for Laboratory Apparatus and Chemicals

200 East 19th Street, New York City

Washington, D. C., Display Room, Suite 601, Evening Star Bldg., Penna. Avenue and 11th Street

PITTSBURGH, PA. 8085 Jenkins Arcade

CHEMICAL & METALLURGICAL ENGINEERING

A consolidation of
ELECTROCHEMICAL & METALLURGICAL INDUSTRY *and* IRON & STEEL MAGAZINE
H. C. PARMELEE, Editor

Volume 29 — New York, September 24, 1923 — Number 13

Helping Make Milwaukee Famous

WHATEVER it was that made Milwaukee famous has long since gone the way of the watch that made the dollar famous. Both are but pleasant memories—and for that matter so, too, is the sixty-sixth meeting of the American Chemical Society, which was held in Milwaukee during the week of Sept. 10. Yet as we look back at the meeting there are certain lessons that can well be drawn from it.

In respect to a number of arrangements the meeting at Milwaukee was an experiment in society procedure. The operation that removed the ceremonious complimentary dinner to the councilors was a notable success. It permitted that august body to hold two long busy sessions without the interruption that in the past has often interfered with or prevented the completion of the society's business. The council made some needed changes in governing policies, such, for example, as the provision for regional representation on the board of directors; but what is probably more important was the general awakening to the serious significance of such problems as those of intersectional meetings and classified membership. The change in the usual order of program that permitted some of the divisions to hold special technical meetings on the first day of the convention was welcomed by a good part of the membership. Still what was hoped to be accomplished by this change was almost defeated by the fact that in many ways the program, as regards both the general and the special sessions, was considerably below standard. Some of the divisional programs were so unsatisfactory and the papers were so poorly presented that more than one group meeting dwindled down to an ignominious conclusion with no one present but the speaker and the section officers or their proxies. There can be no doubt that there is a crying need for the sectional and national officers of the society to work together in such a way as to bring about a better selection and a higher quality of technical papers and discussions.

As regards the more general features of the meeting our comment stands divided. Certainly the Madison trip was a most delightful excursion, and it is unfortunate that less than a sixth of the registration chose to enjoy it. The industrial excursions were well planned, and canceled invitations and changes in schedule were fewer than usual. The entertainment provided by the local section served its purpose well, although it might be criticised on the score that something less elaborate but more intimately chemical in character would have been even better appreciated.

Perhaps it will never be possible to hold a perfect convention—certainly every one cannot be pleased. Future hosts of the American Chemical Society will, however, find much of help in Milwaukee's experience. They will do well to emulate the zeal and enthusiasm that put the convention on such a business-like basis and made it memorable from the standpoint of society affairs. But it should be remembered always that the real drawing card of the convention is its technical program. This cannot be neglected if the society is to continue to hold the interest of the chemical profession.

The Ninth Chemical Exposition

ANOTHER Chemical Exposition has passed into history and from it have been learned some lessons that undoubtedly will materially affect the future plan and scope of the show. During the nine successive years of its existence the Chemical Exposition has experienced important changes. Originally conceived as a means of focusing popular as well as professional attention on an infant industry, it has grown away from the layman and has assumed more and more the character of an exposition for those engaged in some phase of chemical industry. Latterly even the chemical manufacturers have displayed a waning interest, and the show has become almost wholly an exposition of equipment in which the interest of the chemical engineer and the production man in the chemical engineering industries has been paramount. Obviously the show is out of balance.

With a respite of 2 years before the industry is called upon to hold another exposition, there is a feeling that careful stock should be taken of past performance and that constructive plans should be laid immediately to remedy past deficiencies. The first thing to do is to determine what kind of exposition is wanted and what purpose it is to serve. It will then be possible to lay long-time plans to achieve this end. The exposition has a function of creating public good will for the chemical industry among investors and bankers. To this extent it should feature some exhibits that are broadly educational. A start was made in this direction this year, but the result lacked that coherence and unity that can come only from a carefully considered plan. Another function of the exposition may be regarded as commercial and industrial, and to this extent the show must be a buyers' and sellers' marketplace. But even in this aspect it will be incomplete unless chemical as well as equipment manufacturers can be attracted and assured of the proper quantity and quality of consumer attendance.

There were many favorable aspects to the exposition just closed. The consensus among exhibitors was to the effect that the quality of the attendance was

superior to that in recent years and quite satisfactory from a commercial point of view. The curious and aimless sightseer was not in evidence and the ubiquitous collector of catalogs was notable for his absence. The student situation was handled much better than ever before, with consequent advantage to exhibitor as well as student. The course of lectures in chemical engineering proposed by *Chem. & Met.* proved to be a successful feature. Finally it is to be noted that certain railroads again exhibited the raw material resources of their respective territories—a happy augury of industrial development.

Of interest in connection with the Chemical Exposition is the action of the Chemical Equipment Association taken last week in appointing a committee to ascertain whether the time is opportune for a strictly equipment exposition to be held in connection with one of the meetings of a technical society devoted to chemical engineering. The thought behind this is to develop a strictly buyers' and sellers' show, and the purpose of the inquiry is to determine whether the time is ripe to undertake it. We are advised that there is on the part of the Chemical Equipment Association no feeling of opposition to the Chemical Exposition as originally conceived, although it must be evident that ultimately a decision of the Chemical Equipment Association might materially affect the character and extent of future shows. Evidently there is much thinking and planning to be done during the next 2 years.

Analyzing the Causes Of Industrial Accidents

IN ITS recent completion of a study of the causes of 350,000 industrial accidents, the National Bureau of Casualty and Surety Underwriters has performed a service definitely worth while to our industries. Although carried out principally to make possible a new schedule for the underwriting of insurance for workmen's compensation, this study should be of service to plant managers and operators at large. Men responsible for the management of plants will find, in the new system for measuring the compensation cost of accident hazards, a means for more intelligent elimination of the causes of accidents.

The most striking revelation of the analysis is the seriousness of machine operation as an accident factor. Because of the wide and growing application of machinery to every unit process of chemical engineering this finding is significant. The percentage of machine accidents in our industries varied from 20.1 per cent in those that are strictly chemical to 40.5 per cent in the paper industry. The percentage of total accidents occurring at the point of operation of these machines varied from 14.5 to 34 per cent. In other words, from one-sixth to one-third to all accidents were traced to this single critical point.

Accidents occurring in manual processes can in many cases be avoided only by alertness and care upon the part of the workmen. Largely for that reason they are the most difficult to eliminate. However, even here we find that we can in very many cases remove the causes of accidents. The point of operation of machines, if our observation is correct, can in the majority of cases be made foolproof readily and at small expense. Increasing safety at any cost is a humanitarian measure and as such appeals strongly to those responsible in management. The savings in insurance alone through the removal of this hazard bid fair, under the new system, to defray the expense of the additional equipment found necessary in making changes. Although these figures show that from 65 to 80 per cent of the total accidents in our industries occur at other points or through other agencies than operation of machines, the wisdom of removing this one fruitful and growing point of hazard is evident. There will be constantly lessening justification for neglect at this or any other place in the plant as the causes of accidents are further analyzed and the means of their prevention made clear.

The Old, Old Conflict

NEWS from abroad is to the effect that A. G. Green has resigned his post as chief chemist and director of research of the British Dyestuffs Corporation, Ltd. The reason given is his "dissatisfaction at the lack of technical knowledge on the board of directors and his belief that the permanent establishment of the dyestuff industry in this country [Great Britain] is impossible under such conditions."

We have no comment to make in regard to the gentlemen with whom Sir William Alexander has surrounded himself, or rather whom the stockholders elected to the board. We said last year and we still think that with so eminent a chemist as Dr. Herbert Levenstein at hand, who was then and probably remains the largest individual stockholder in the concern, it was a great pity that his wide knowledge of dye technology was not made available.

But quite apart from the dye industry, the episode reflects a situation that is all too common in our own country. Industrial companies are largely directed by financiers and lawyers of whom not one in a hundred knows anything about the business. Where one financial or legal light is needed to work and think and render service, a dozen of them are elected and thus even the financial broth is often spoiled by too many cooks. So long as this endures we may justly expect protests against the administration of industry and cleverly worded but futile excuses in the annual reports of manufacturing concerns. We have no information beyond the published reports of the resignation of Mr. Green. He may have been in the wrong and the directors in the right in whatever the disagreement was that led to his leaving. But a situation should not be permitted to arise in which so eminent a man is able to give such a reason for his departure. When one assumes membership in the board of directors of a great corporation he has obligations as a trustee. Chief among these is his ability to understand the company's problems, and if he lacks the capacity for this, he should refuse to serve.

Let's illustrate the point by a story which is told by H. H. Kohlsaat in his reminiscences. It appears that when the New York *Times* was for sale there came to him a young man named Adolph Ochs from Chattanooga who owned a newspaper there, and he said he had the opportunity to buy the *Times* and that he could swing the purchase. "But what worries me," said he, "is that I'm afraid I don't know enough to run a big metropolitan daily." "Well," said the genial veteran

of the Fourth Estate, "if you don't tell that to anybody, maybe nobody will find it out." That was the encouragement he needed and he made of his purchase one of the greatest newspaper properties in the world.

It is this quality of modesty which we should like to instill into the minds of successful business men when they are invited to go on the board of any chemical or metallurgical establishment. No journalist, no matter how great his fame or what his capacity, could put over the excuse that he was leaving the *Times* because the administration doesn't know how to run a newspaper. The same should be true of chemical and metallurgical companies. The management, including the directorate, should know their business. It would inspire confidence if they were known to know it.

Importance of Efficient Mixing

NO, WE are not about to discuss social amenities, the value of geniality or the development of the hail-fellow-well-met type; although the immiscibility of humanity in general would serve as a text for many a discourse. Our subject is the mechanical blending of inanimate matter—one of the fundamental processes of chemical engineering.

The failure of many mixing operations in which standard and mechanical methods are not adopted is due in large measure to a similarity in color of the components of the mass. The eye is deceived. Assayers who use red litharge and white chemicals as a flux appreciate the fact that even distribution of the metallic collector is not reached in the time one would assume it had been reached had all the components been of the same color. The need for chemical or physical tests, and the mechanization of the process, to insure uniformity of the final product, is being recognized to an increasing extent.

Efficient mixing is an important factor in the strength and appearance of sundry building materials. We are familiar with the tedious process that is usually on exhibition outside buildings in construction—the hand-mixing in a large shallow box of lime putty and sand, or other ingredients of plaster. The personal equation figures largely in all such operations. A mistake in measurement, or the development of "that tired feeling," may spoil the batch. The ingredients may be of first-class quality, but without proper blending, the achievement of which is difficult without constant testing, failure may result. To prevent this, it is interesting to note that the president of an enterprising Los Angeles firm, William C. Hay, of the Blue Diamond Materials Co., controls a patent for a process of mixing efficiently the essential constituents of various building materials, particularly lime mortar. The finished product, of uniform quality and physical characteristics, is delivered into motor trucks, by which it is speeded to the scene of building operations. The result is the avoidance of much costly and tedious manual labor, in addition to increased efficiency in construction and less mess. The process is being licensed in various Eastern and mid-Western cities, and the adoption of the underlying idea of centralized mixing operations promises to facilitate construction work in congested districts and reduce the costs of erection.

More recently, W. L. Stone and J. Russel Ellis, of Los Angeles, a city that seems to lead in many improvements of this kind in the West, started to operate a concrete mixing plant with a capacity of 365 cu.yd. per 8 hours. It consists of bins, mixers, conveyors and a fleet of heavy dump trucks and light auto vans. The advantage to all concerned, by the purchase of ready-mixed concrete, are too obvious to need reiteration. By the use of standardized products of uniform character, the responsibility for failure will rest squarely on the manufacturer of the mixture, who, in turn, will see that the raw materials are of the best quality and that the operations of mixing and blending are systematized in such a manner that failure cannot occur. The manual-labor method is unsatisfactory for many reasons: personal neglect is difficult to detect; neither is it easy to controvert assertions to the effect that faulty material was supplied in the first instance.

The development of the mixed-concrete and lime-mortar industry in large cities may necessitate further research on the value and scope of retardents and accelerators, to hinder or to quicken setting. In many instances the value of slow setting is obvious, thus providing time for transportation. It will pay chemical engineers to interest themselves in the mechanical preparation of mortars and plasters.

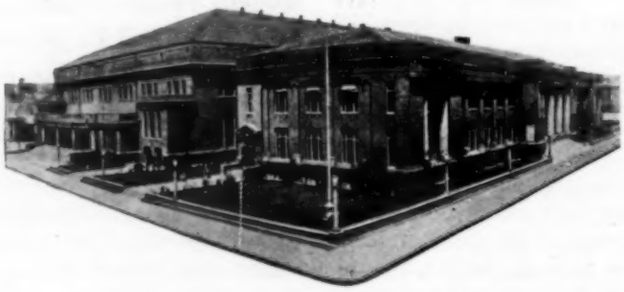
Ocean Products and Chemical Engineering

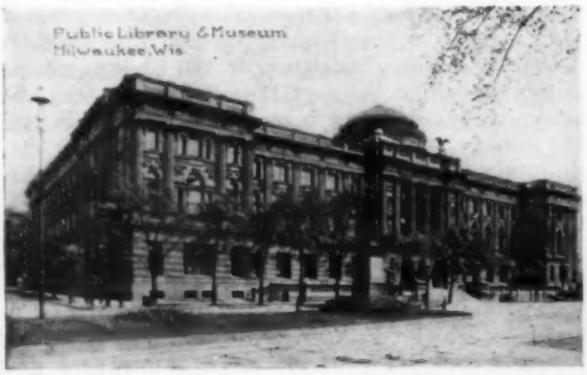
PLANS for insisting on the cheaper production of Chilean nitrate, by the adoption of large-scale operations and more efficient methods of beneficiation, might well include taking a direct interest in the industry or restricting imports to a minimum. Unfortunately for Chile the attractions for capital and chemical engineers within our own borders are so alluring that few dollars and fewer technical men of high standing in the profession venture abroad to practice, where risks are greater and where other disadvantages are apparent. It is as well to mention, in passing, that the interest shown by so many Britishers in the Chilean nitrate industry is due to the fact that financially they can do better abroad than at home. The reverse is true of the average American chemical engineer, hence the lack of interest on our part in technological standards on the pampa.

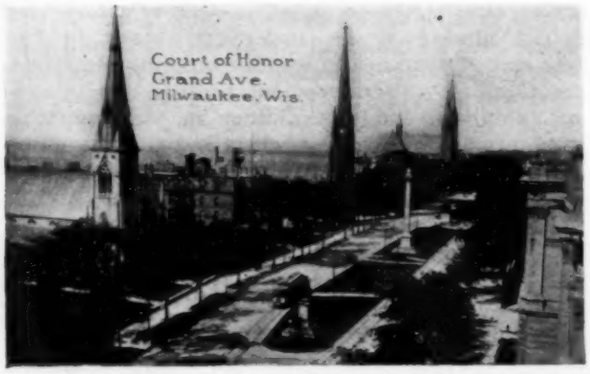
The encouragement of every branch of the domestic fertilizer industry here connotes the exploitation of national reserves. Around thousands of miles of our shores is an almost inexhaustible supply of raw material from which fertilizer can be made. The utilization in the fishing trade of discarded or scrapped government vessels, sold "for a song," should insure cheap harvesting. The expression of oil from whale blubber and the manufacture of dessicated fertilizer from the meat is so successful a financial and technical venture that an expansion of activity may be forecast in this phase of chemical engineering. More recently the utilization of fish waste from canneries and markets, and the production of commercial products, has become an accomplished fact, largely because of the development of self-contained drying, disintegrating and oil-expressing machines, built on the unit plan. The amount of raw fertilizer material in the ocean is beyond computation. Moreover, it is more accessible to us than Chilean nitrate. It will pay us to give more attention to the potentialities of exploitation in King Neptune's dominions.

Milwaukee Plays Host

To the Sixty-sixth Meeting of the American Chemical Society







American Chemical Society

Impressed by

Milwaukee's Technical Progress

An Outstanding Feature of the Sixty-sixth Meeting Was the Opportunity to See at First Hand Practical Results of the Interest Taken by Milwaukee Chemists in Matters of Public Welfare, Particularly the Question of Handling Sanitary and Trade Wastes

EDITORIAL STAFF REPORT

IN many ways Milwaukee was a happy choice as the meeting place for the American Chemical Society. The thousand chemists and their guests who gathered for the sixty-sixth general meeting of the society in Milwaukee Sept. 10 to 24 must have been duly impressed with at least two pleasant realizations. First was the important rôle of their profession in industry, for perhaps no other city in the country produces a more diversified line of manufacture. Certainly few can boast of industries more dependent on technology, even though the one "that made Milwaukee famous" has long since given way to the arts of metal production and fabrication, leather tanning, byproduct coking, coal-tar and chemical production. The second condition unmistakably in evidence was the vital part the Milwaukee chemist is playing in the public affairs of his city. Chemical brains are displacing politics in solving the problems of protecting food and water supplies, and of disposing of the city's sewage and trade wastes.

Chem. & Met.'s news pages last week told of the important council meeting and the first general session.

In keeping with its long-standing custom, the society devoted one of its sessions to the general public. On Wednesday evening at the Marquette University Gymnasium Mrs. Thomas G. Winter, president of the General Federation of Women's Clubs, made a splendid address on "The Relation of Women to Scientific Developments in Our National Life." She emphasized the fact that the women of the United States represent a great potential power because of their effective organizations, and their support is necessary if chemists are to be allowed to serve the true aims of science, free from commercialism. After a brief response by Prof. Edgar F. Smith, who presided, President E. C. Franklin gave a technical discussion of some unusual systems of acids, bases and salts.

The Priestley medal for outstanding work in the field of chemistry, awarded to Dr. Ira Remsen, president emeritus of Johns Hopkins University, was presented in absentia by Prof. Smith, President Franklin being empowered to deliver the medal to Dr. Remsen.

One of the most delightful features of the convention week was the all-day trip to Madison and the pleasant surroundings of the University of Wisconsin. A special train carrying a party of several hundred drew up to the C. M. & St. P. siding alongside of the Forest Products Laboratory at about 10:30 on Friday morning and during the busy 6 hours that followed the visitors were almost overcome with the workings of Badger hospitality. Many took advantage of the opportunity to inspect the Forest Products and the Chemical and Chemical Engineering Laboratories. Others proceeded to see the famous scenery of Madison either by auto-

MILWAUKEE SEWAGE DISPOSAL PLANT—GENERAL VIEW

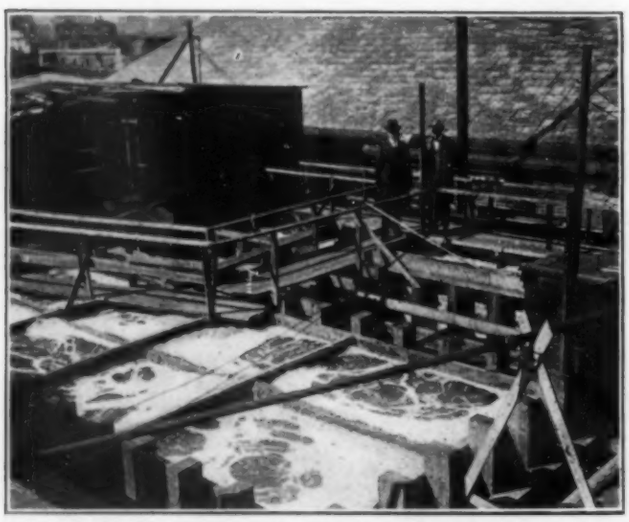
mobile or by a 2-hour cruise on Lake Mendota—one of the four beautiful bodies of water that surround the city and campus. Still others accepted the generous invitation to visit the busy plants of the French Battery Co., Burgess Laboratories and the Marschall Dairy Laboratory. A complimentary luncheon at Lathrop Hall and some pleasant words of welcome from the dean of the graduate school and from Prof. J. H. Mathews on behalf of the local section were all that were needed to complete the picture of a perfect day.

How Milwaukee Solved Its Sewage and Trade Waste Problem

Milwaukee Chemists Have Played an Important Part in Modifying the Activated Sludge Process to Meet Local Conditions

WITH the sewage and trade wastes from a residential and industrial district of more than 500,000 population discharging into Lake Michigan, the source of the city's water supply, Milwaukee has been faced with a problem of ever-increasing seriousness. Preliminary laboratory studies in 1915 having demonstrated the possibilities of the activated sludge process, tests were continued on a practical scale and an experimental plant was operated for nearly 2 years before the details of the large plant were decided upon.

Because of the magnitude of this project and the peculiar nature of the sewage, some of the problems which developed were most intricate and were solved only by the application of scientic research of the highest order. As the purified sewage effluent must be returned to Lake Michigan, from which the municipal water supply is drawn, a very high standard of purity has been adopted. The purification process must remove 90 per cent of the bacteria and 95 per cent of the solids suspended in the sewage and the effluent must be stable for 72 hours. For the same reason, the sludge cannot be dumped into the lake. As it would require a train of 100 tank cars to haul the daily volume of wet sludge out into the country for disposal on land, the only alternative is to make the sludge into fertilizer. This necessitates dewatering and drying the sludge, steps which presented exceedingly perplexing difficulties, as the sludge is colloidal in character and under ordinary conditions holds its 97 or 98 per cent of water so tenaciously that it cannot be squeezed out.

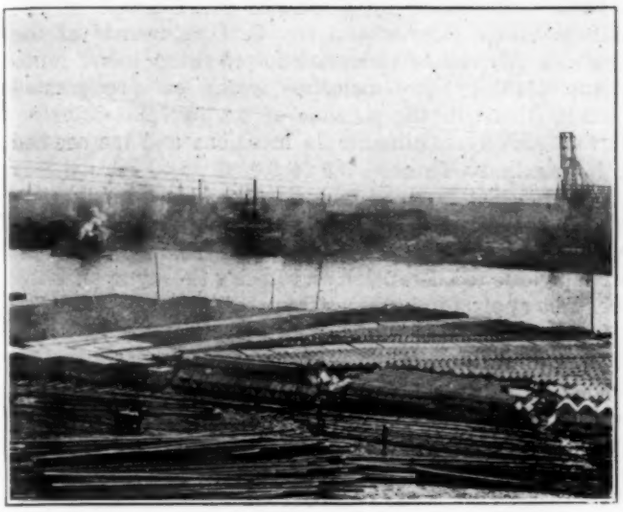


MILWAUKEE SEWAGE DISPOSAL PLANT
Demonstration plant—aëration tanks

This difficulty in dewatering is greatly aggravated by the lower temperatures that prevail during the winter season, and the ultimate success of the project has rested upon the solution of this phase. Before the Division of Water, Sewage and Sanitation, John Arthur Wilson, consulting chemist to the Sewerage Commission, presented in some detail the results of research carried out at the testing station under his direction, with the co-operation of W. R. Copeland and Henry M. Heisig. The dewatering of 500 c.c. of sludge diluted to contain 1 per cent of solid matter in 20 minutes on the standard laboratory vacuum filter was arbitrarily designated as a relative filtering efficiency of 100, or the minimum considered satisfactory in the operation of the plant. Curves plotted in this basis show that the relative filtering efficiency of sludge which is not chemically treated varies from 5 in February to 100 about the first of September. By adding enough sulphuric acid to the sludge to reduce its p_H value to 3.4 the rate of filtration can be increased by about 400 per cent and a curve representing this condition indicates that the sludge can now be dewatered efficiently from May to November. Heating to 160 deg. F. sludge with p_H adjusted to 3.4 brings the entire seasonal curve above the 100 line. Details of these studies will be found in the comprehensive Ninth Annual Report of the Sewerage Commission of the City of Milwaukee.

By invitation of the Sewerage Commission and through the courtesy of the Goodrich Transit Co. in placing the steamer "Illinois" at their disposal, it was possible for a large group of the society to visit the large-scale plant now under construction. Because of its unusual importance in representing applications of fundamental chemical engineering processes in sanitary engineering, features of the plant will be considered briefly.

Intercepting sewers are being built which will bring



MILWAUKEE SEWAGE DISPOSAL PLANT
Precast concrete separator blocks and Filtros containers (about 20,000)

all sewage and trade wastes to the plant on Jones Island. After passing through bar screens to remove all large materials and grit chambers where the mineral matter separates out, the raw sewage will pass through eight revolving drum screens of the Link-Belt "Tark" type. The material which fails to pass through the ⅜x2-in. slots is brushed off onto a Sandvik steel belt which feeds a pneumatic ejector discharging the screenings into a hopper. From this the screenings pass to the driers referred to later. The effluent from the screens is mixed with 15 to 20 per cent by volume of sludge that has been through the process and has thus been activated. The mixture is then distributed to concrete aëration tanks with rows of Filtros plates set in the bottom, through which air is forced at 8 to 10 lb. pressure to produce complete and uniform aëration. After 6 hours treatment, about 95 per cent of the organic matter is precipitated and a remarkable purification is effected. The aërated liquor then passes to sedimentation tanks equipped with Dorr thickeners, where separation into sludge and clear effluent is effected continuously. The effluent, clear and colorless as drinking water, 98 per cent of the bacteria and 97 per cent of the suspended matter having been removed, will be returned to the lake.

There are twenty-four of these aëration tanks, each 236 ft. long by 44 ft. effective width and 15 ft. effective depth, with a daily capacity of 3,500,000 gal., and eleven Dorr thickeners, 98 ft. diameter by 15 ft. depth of liquor, each capable of treating 13,680,000 gal. per day.

Sludge Will Be Dried for Fertilizer

Activated sludge containing about 98 per cent water is discharged by the Dorr thickeners. About 90 per cent of this will be returned and mixed with incoming raw sewage. The remainder will be heated, acidified with sulphuric acid to obtain the optimum p_H and filtered on thirty Oliver continuous vacuum filters, each with a minimum capacity of 25,000 lb. of cake containing 80 per cent moisture per 24-hour day. After passing through heat-exchangers, the effluent from the filters will be discharged in the inner harbor.

Further reduction in the water content of the sludge cake down to 10 per cent will be accomplished in six Atlas driers of the direct-indirect type. After screening and grinding, the sludge will be in the form of a tankage containg 7.32 per cent total ammonia, 4.61 per cent total available ammonia, ready for mixing with potash and phosphate to form a complete fertilizer. It is estimated that 1¼ tons of dry tankage will be obtained per million gallons of sewage; hence, an initial production of 100 tons daily is expected, which will increase yearly with the population.

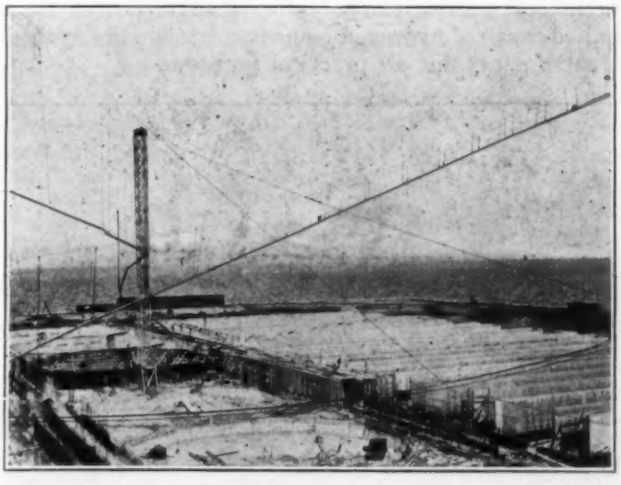
Division of Water, Sewage and Sanitation

Intense Interest Is Reflected in Discussions of Sewage Disposal and Water Purification Problems, Particularly as Affecting Milwaukee

LOCAL interest as well as an unusually attractive program was responsible for two popular and enthusiastic sessions of the Division of Water, Sewage and Sanitation. John Arthur Wilson's paper on the "Scientific Development of the Activated Sludge Process at Milwaukee" was the center of a discussion that involved many of the sanitary chemists and engineers who have followed this project with intense interest. This formed a part of a symposium that brought forth several valuable additions to our knowledge of this method of sewage disposal.

Activated Sludge Symposium

Dr. F. W. Mohlman, chief chemist of the Sanitary District of Chicago, discussed the filtration of activated sludge. Operation on a working scale of four types of filters (Simplex plate and frame, Worthington platen, Oliver and American continuous) at the Des Plaines and Calumet plants has shown that treatment of activated sludge with filter alum before filtration flocculates and coagulates the solids and greatly improves filtration. Alum has proved to be superior to sulphuric acid from a practical standpoint. The cost is about the same in each case and the very small addition of alum to the sludge is of negligible significance. Experience at the Corn Products plant at Argo, Ill., seemed to confirm the superiority of alum over



MILWAUKEE'S SEWAGE DISPOSAL PLANT
View of southeast quarter of plant, showing aëration and sedimentation tanks.

other coagulants. Other conclusions brought out in this work are that dilution of sludge frequently accelerates filtration and that the moisture content and biological condition of the sludge are controlling factors in filtration.

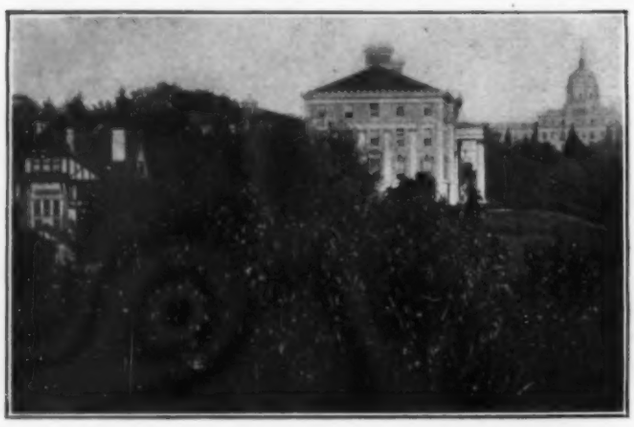
Prof. Edward Bartow, head of the chemistry department at the State University of Iowa, described the treatment of waste from a packing house at Mason City, Iowa. In 1921 an activated sludge plant had been constructed there. Originally it contained a sediment and grease tank, an aëration chamber and a Dorr clarifier. It did not accomplish complete treatment, although great improvement was noted. The excess sludge was mixed with tankage and sold as fertilizer. In remodeling the plant there have been added a Dorr clarifier and a grease skimmer for the removal of heavier solids and greases and a new aëration tank which will double the aëration capacity. Putrefaction in the clarifier is prevented by returning the clarified effluent during periods of low flow.

Others who contributed to the discussion of activated sludge included William R. Copeland, chief chemist, and T. Chalkley Hatton, chief engineer, of the Milwaukee Sewerage Commission. Dr. Fales of Metcalf & Eddy introduced some valuable confirmatory evidence of the dissimilarity of sewages as related to the activated sludge process.

Problems in Water Filtration

Dr. George N. Prentiss, chemical director of the C. M. & St. P. R.R., reported that a committee of chemists from the local section of the society had investigated the advisability of filtering the Milwaukee city water supply. Their recommendation—by majority opinion—was that the filtration project might well wait the solution of the sewage disposal problem, since at present the city water apparently offers no menace to the health of the community. This is a controversy of long standing, however, and most of the sanitary chemists present seemed to agree with a statement by one of their number that "chlorination without filtration is a pretty slender thread on which to hang the health of half a million people."

Dr. W. D. Hatfield of the filtration plant at Highland Park (Detroit), Mich., offered a modified hematoxylin (colorimetric) test to replace the tedious gravimetric method of determining soluble aluminum in filtered waters. Apparently when restricted to a limited range of hydrogen-ion concentration, the method is satisfactory for all practical purposes.



A GLIMPSE OF THE UNIVERSITY OF WISCONSIN

Data contributed by Prof. A. M. Buswell of the Illinois Water Survey and Dr. G. P. Edwards of the Sanitary District of Chicago showed the point of minimum solubility or isoelectric point of precipitated alumina to be in the p_H zone of 6.2 to 7.2. Color removal from dyes, pine-needle infusions and tea seemed to be maximum from p_H 5.5 to 6.0. If, as Loeb's theory holds, the color removal is due to chemical combination, it would be expected to have a minimum at the isoelectric point. The authors hold that color removal is probably due to adsorption and Loeb's theory apparently does not apply to aluminum hydroxide.

Two papers from the Bureau of Chemistry by J. W. Sale, C. H. Badger and W. W. Skinner were concerned with the composition of certain American mineral waters and waters from the lakes of North Dakota.

Division of Industrial and Engineering Chemistry

Of the Papers Presented, Those on the Mechanism of Corrosion Were of Most General Importance

SEVERAL papers of industrial significance were presented before this division. A paper by W. G. Whitman and R. P. Russell on natural water corrosion of steel in contact with copper was read by R. T. Haslam.

Experiments were described wherein the natural water corrosion of steel in contact with a metal lower in the electromotive series has been quantitatively determined. The results show that the total corrosion is the same with bare steel plates as with steel specimens of the same size having 75 per cent of their surface copper plated—i.e., in the latter case the corrosion per unit area of steel is four times as great as in the former. The total corrosion observed is determined by the total effective surface available for the depolarization of hydrogen by dissolved oxygen, the actual corrosion occurring on the steel alone.

These results are not readily explainable by the colloidal theories of corrosion advanced by J. N. Friend or Bengough and Stuart, both of which agree that hydrogen is not an essential in natural water corrosion. The data are, however, in entire accord with an electrolytic mechanism of corrosion. The electrolytic theory explains these results by picturing the increased corrosion per unit area of steel as caused by the depolarization of a film of nascent hydrogen. This film is deposited on the steel and on the adjacent copper surface and its removal is effected by diffusion of dissolved oxygen into the metal. The rate of corrosion is limited by the rate at which oxygen can diffuse in to react with the surface film of nascent hydrogen.

The importance of these quantitative data in deciding as to the mechanism of the corrosion of steel is emphasized from both a theoretical and practical point of view.

Dr. Haslam also read a paper by F. N. Speller and C. R. Texter on the effect of alkaline solutions on the corrosion of steel immersed in water.

These studies showed that the rate of corrosion in steel pipe is decreased in a closed system by increasing concentration of the alkali, but no point was found where corrosion increased to a maximum in alkaline

solutions; nor did corrosion cease within the limits of alkalinity used in these investigations (4.7 grams per liter) under oxygen contraction and temperature conditions which were used to approximate hot water and boiler conditions.

Apparently the first effect after starting the flow of an alkaline water through clean pipe is the rapid formation of a protective coating or film which prevents an intimate contact with the metal of the water.

It is probable that this film formation is of greater importance in corrosion than the decrease in hydrogen-ion concentration of the water. This film is so adherent as to require cleaning with acid before the original rate of corrosion is restored. As indicated by a check test with neutral water in this case, the film was evidently caused by the alkalinity and not by the scale-forming constituents in the water as shown by runs with alkaline and distilled water. Other investigations (not yet published) carried on by the authors indicate that the protective effect of this film and its permanence may be greatly increased by the addition of alkaline reagents to the water.

Division of Leather Chemistry

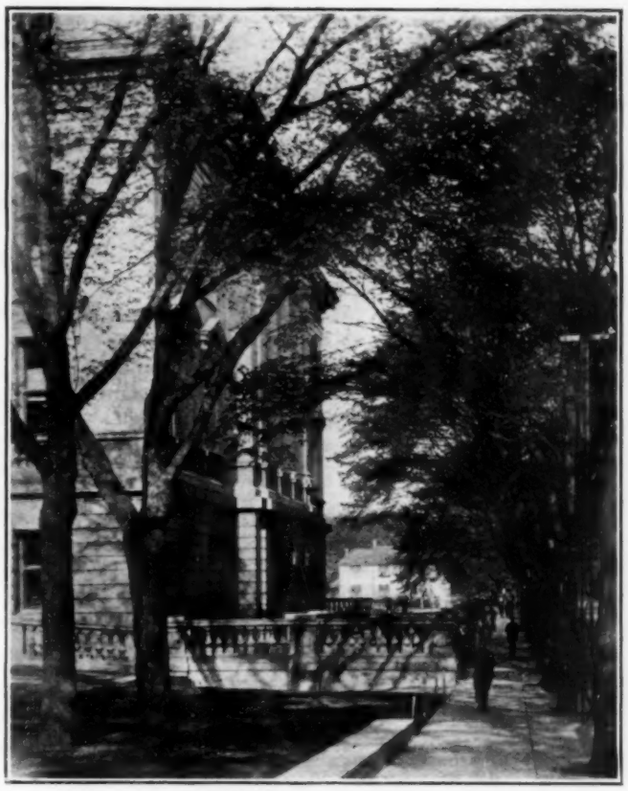
Many of the Fundamental Problems of the Tanning Industry Are Being Cleared Up as a Result of Investigations Reported Before This Division

BECAUSE of the close relationship between the fundamental problems covering certain phases of leather and gelatine manufacture, the council approved the request that the name of this group be changed to Division of Leather and Gelatine Chemistry. It is planned to interest manufacturers as well as users of gelatine so that there may be a common meeting place for the discussion of problems.

Accordingly, the meeting opened with a symposium on gelatine. Much of the discussion centered on the two so-called isoelectric points of gelatine, one at p_H 4.7, the other at p_H 7.7. Both points occurred as minima in absorption spectrum measurements by J. H. Mathews and H. P. Higley. That the two points of minimum swelling are not due to impurities was shown by John Arthur Wilson in repeating the experiments using Eastman's ash-free, highly purified gelatine. Since the transition point of gelatine from the gel to the sol state is at 38 deg. C., if collagen behaves like gelatine, a minimum fixation of tannin at 40 deg. C. would be expected in the region of p_H 7.7. This was found by A. W. Thomas and M. W. Kelly.

Clarke E. Davis and Henry M. Salisbury made careful studies of the variation of the surface tension of gelatine solutions (bone, hide and ossein) with concentration, temperature, p_H and age of solution. Increase in the first two factors causes a decrease in surface tension; there is a minimum near the neutral point, while age has little effect. Further investigations on the effect of container walls in apparatus for measuring jelly strength and elasticity were presented by S. S. Sweet and S. E. Sheppard.

Representing the gelatine producer, L. M. Tolman pointed out that manufacturing difficulties seem to indicate that crude gelatine is even more complex than the highly refined material upon which most of the above tests have been made. He outlined briefly such problems as purification of air entering driers and the many types of driers which had been tried for commercial work.



ON THE CAMPUS AT WISCONSIN

Further Light on Tanning Mechanisms

Dr. Margaret W. Kelly continued studies on the fixation of tannins of quebracho, wattle bark, hemlock bark, oak bark, gambier and larch bark by hide substance as a function of concentration using 2 weeks and 21 weeks instead of the 24-hour period reported last year. Plotting the amount of tannin fixed against concentration, the curves rise to a sharp maximum and then fall off, the maxima being sharper with the more astringent extracts.

A. W. Thomas showed the marked similarity between tanning collagen (or hide substance) with tannic acid and with vegetable extracts commercially used, except that there is no tanning on the alkaline side of p_H 8, thus verifying the Procter-Wilson theory of vegetable tannage. Dr. Thomas also reported the influence of gallic acid and of pyrogallol upon wattle and gallotannin tannages. Results obtained show that the presence of "non-tans" does not always result in a retardation of the rate of tannage. Under certain conditions a "non-tan" may accelerate tanning. The chemical nature of the "non-tan," the amount present, the amount of tannin present and the p_H of the solution are factors which may markedly influence the reaction.

Investigation of combination of quinone with collagen at different p_H values shows no tanning action unless the solution is more alkaline than p_H 5. The degree of tannage curve rises rapidly from p_H 5 to 8, then falls slightly to p_H 9, rising therefrom to p_H 10 and then falls with increasing alkalinity. In 24 hours 100 parts of hide substance fix at p_H 10 as much as 33 parts of "tannin," which increases to 47 parts in two weeks' time, according to studies by M. W. Kelly.

Chrome tanning was also studied from several angles. Erwin J. Kern found that with increasing acidity there is a decrease in rate of combination of Cr with hide substance. According to M. W. Kelly and S. B. Foster, the fixation of chrome as a function of the concentration of basic chrome liquors by leathers previously tanned with wattle at p_H 2 and 5 over periods of 48 hours, 8 and 16 weeks shows that the presence of vegetable tannin markedly reduces the degree of chrome tanning. Hydrogen-ion determinations made by H. B. Merrill on solutions of pure aluminum sulphate and of chromic sulphate at various concentrations and after the addition of H_2SO_4, NaOH, NaCl or Na_2SO_4, indicate that the hydroxide ion is more firmly bound by Al than by Cr, which helps to explain why Cr combines with hide substance so much more readily than Al.

Division of Organic Chemistry

Considerable Discussion Aroused by Papers on Petroleum as a Chemical Raw Material and Industrial Syntheses Using Acetylene

THREE of the sections and divisions held special meetings of general interest on the opening day of the convention. One of the most interesting to *Chem. & Met.* readers was the program of the Organic Division, of which Dr. Frank C. Whitmore is chairman. The first paper, by Prof. J. A. Nieuwland of Notre Dame University, reviewed the uses of acetylene in synthesis. He laid particular stress on the series of reactions now carried out by the Canadian Electro-Products Co. at Shawinigan Falls, Que., to yield glacial acetic acid, acetaldehyde, acetic anhydride, acetone, formaldehyle and methyl acetate. The conversion of acetaldehyde to acid is carried out in aluminum converters, using 50 atmospheres pressure. Manganese acetate is the catalyst used. Dr. Nieuwland also sketched some of the possibilities of future progress in the use of acetylene in synthesis.

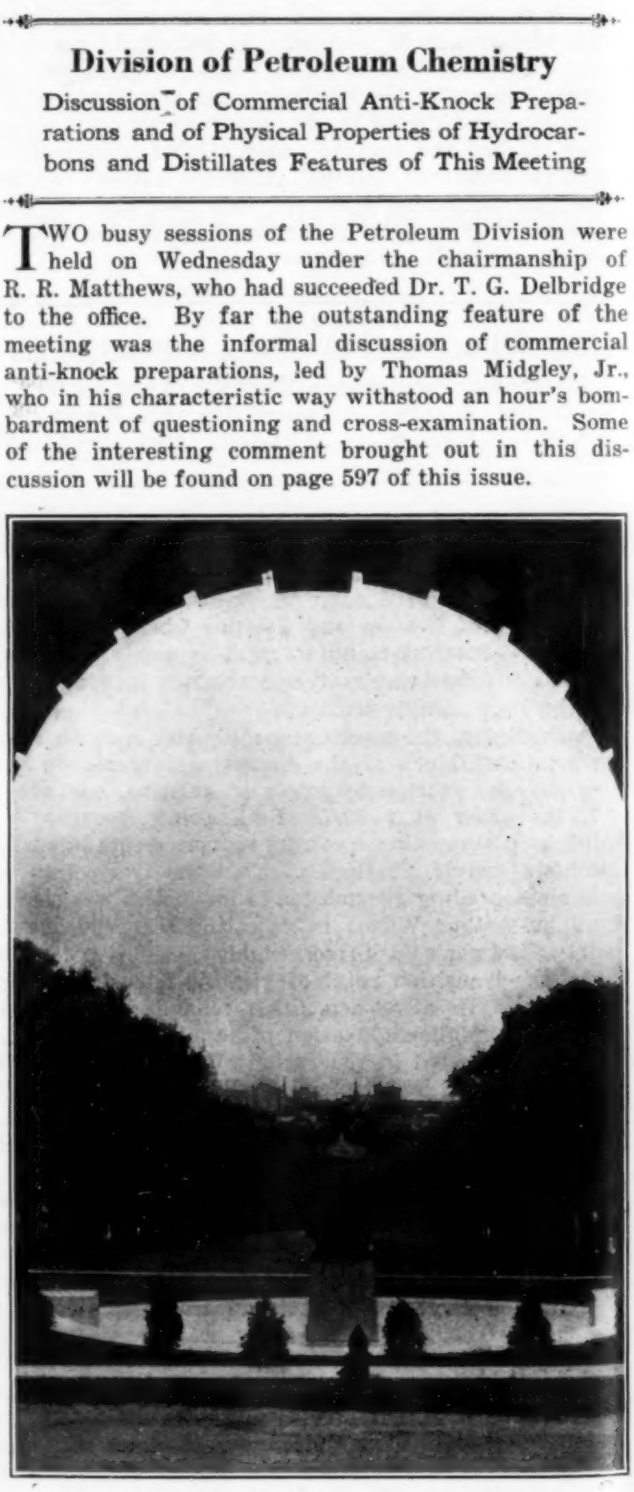
A paper on "Petroleum as a Chemical Raw Material" attracted considerable attention both from the organic chemists and the few petroleum technologists present at the session. When its author, Dr. B. T. Brooks of New York, declared that the "so-called petroleum chemists" were concerned only with trivial matters of physical and chemical testing and were inclined to pay little attention to sources of serious loss to their industry, he drew a rejoinder from Dr. W. F. Faragher of Mellon Institute. The latter was of the opinion that the losses were not nearly so excessive as sometimes painted and that the petroleum chemist was at work on the fundamental problems of production and refining.

Dr. Brooks maintained that it is a misnomer to call the petroleum industry a chemical industry today. Its processes are mostly physical, he declared, and chemistry's contribution has been trivial and sometimes of questionable significance. Petroleum is sometimes referred to as a rich mixture of raw materials which should yield a wide variety of chemical derivatives comparable with the large number of substances that have been prepared or manufactured from coal tar. The problem of isolating pure substances from petroleum is, however, quite different and for the most part as yet unsolved. Synthesis of hydrocarbons is recommended as a better method of attack than the attempts that have been practiced at isolation. Dr. Brooks said that our present chemical knowledge of the hydrocarbons in petroleum enables us to make only a very limited survey of what might be expected in the way of a chemical development of this raw material. Isopropanol and the series of higher alcohols now being made by the Standard Oil Co. of New Jersey, ethylene chlorhydrin and the various products manufactured from the olefine gases by the Carbide & Carbon Chemicals Corporation were cited to show the trend of recent developments.

Division of Petroleum Chemistry

Discussion of Commercial Anti-Knock Preparations and of Physical Properties of Hydrocarbons and Distillates Features of This Meeting

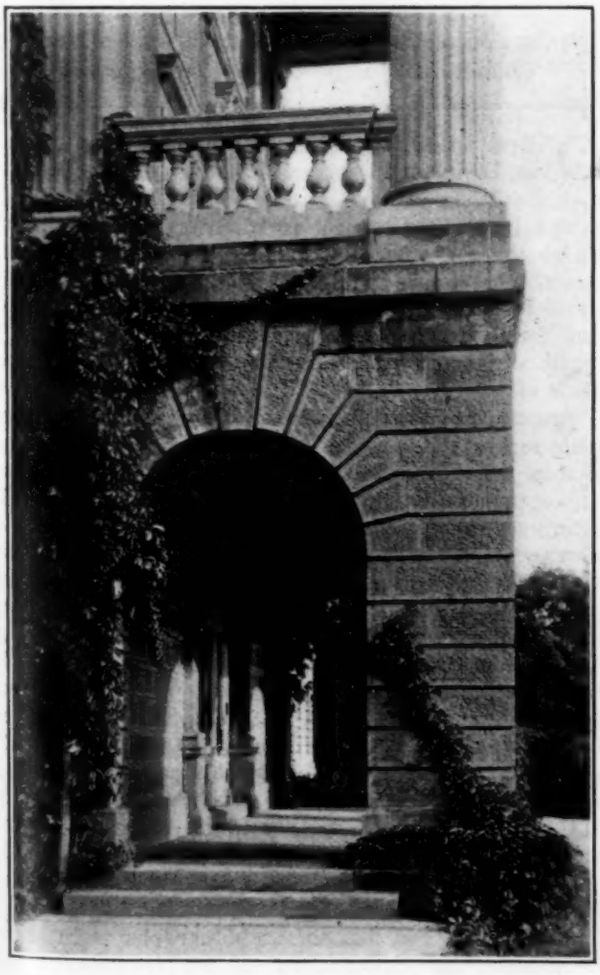
TWO busy sessions of the Petroleum Division were held on Wednesday under the chairmanship of R. R. Matthews, who had succeeded Dr. T. G. Delbridge to the office. By far the outstanding feature of the meeting was the informal discussion of commercial anti-knock preparations, led by Thomas Midgley, Jr., who in his characteristic way withstood an hour's bombardment of questioning and cross-examination. Some of the interesting comment brought out in this discussion will be found on page 597 of this issue.



MADISON AS SEEN FROM THE UNIVERSITY

In its first session the division led off with a series of papers on the accurate measurement of the physical constants that are of significance to the refiner and user of petroleum products. The discussion of these papers brought out the dawning realization on the part of the industry that there is no need of using 0.5 as a figure for the specific heat of a distillate when measurements show that it varies from 0.36 to 0.68 over a range of 200 deg. F.

Prof. J. H. Mathews of Wisconsin described his apparatus for measuring heats of vaporization. Papers on vapor pressures and specific heats were presented from the laboratory of Professors E. H. Leslie and A. R. Carr of Michigan. Prof. R. T. Haslam of the Massachusetts Institute of Technology, in presenting a paper by D. P. Barnard, 4th, H. M. Myers and H. O. Forrest extended the valuable work of the Institute on lubrication. Two papers were presented from the laboratories of the Standard Oil Co. of Indiana. One was by R. E. Wilson and W. H. Bahlke on the physical properties of paraffine hydrocarbons and the other by R. E. Wilson and R. E. Wilkin on a method for estimating oil in paraffine by a refractometer designed to supplant the press method. A paper by C. R. Wagner presented a rather fundamental study of the hydrocarbons in mid-continent kerosene. By selective solubility in liquid sulphur dioxide, hydrogenated naphthalenes were separated from the main bulk of the fractions, consisting apparently of naphthenes. Following a paper of methods of reducing viscosity of heavy Mexican fuel oils, by R. A. Brownlee, Thomas Midgley gave his very interesting discussion of the commercial use of tetraethyl lead and other anti-knock materials in ordinary gasolines.



A PICTURESQUE ARCHWAY

In connection with the discussion of the study of physical properties of hydrocarbons and distillates, it was brought out that no information is available concerning sources of pure hydrocarbons necessary for such work. It is probable that the Petroleum Division will attempt to collect information concerning hydrocarbon supplies for research purposes, as well as to make such substances available through existing channels.

R. R. Matthews of the Roxana Petroleum Corporation, St. Louis, and W. A. Gruse of Mellon Institute, Pittsburgh, were re-elected to the offices of chairman and secretary respectively; R. E. Wilson was chosen as vice-chairman and E. W. Dean and W. F. Faragher were re-elected to the executive committee.

Gas and Fuel Section

Improved Steam-Iron Process for Hydrogen, Coking Tests and Possibility of Enriching Blue Water Gas by Catalytic Formation of Methane Discussed

CONTINUED interest in the Gas and Fuel Section of the society was evidenced by the good attendance and by the presentation of more than a dozen interesting papers giving research results on various fundamental chemical and engineering aspects of the gas and fuel industry. An improved steam-iron process for the production of hydrogen which is substantially a new method was described in a report by E. R. Weaver and P. G. Ledig, of the Bureau of Standards. The method involves an entirely new cycle designed greatly to conserve the heat otherwise lost, and extensive data on semi-commercial scale experiments conducted over a period of several months at Trenton, N. J., by the Bureau of Standards were presented. The data include, in the opinion of the authors, sufficient information to permit design of a plant and prediction of performance which is believed to be superior in thermal efficiency to any previous method. The investment required is not greater than in the Messerschmidt process and is much lower than in the Lane process.

Coking of small quantities of coal to determine suitability for coke-oven use was discussed by Walter J. Klaiber, of the Koppers Company research laboratory. He described a new box coking test which gives results closely approximating those in a full oven test. The box, usually of 16-gage sheet steel approximately 12x12x18 in., will hold a 60-lb. coal sample. It is placed in the empty oven and then moved to the center by the pusher before the oven is charged. The box has a loosely fitting cover which slides down onto the coal and allows the experimental coal sample to receive the weight of the coal charged above it, thus giving testing conditions analogous to those prevailing in a regular oven charge. The results permit a very close forecast as to the character and cell structure of the coke which will be made in regular operation.

Discussing sulphur forms in coal, H. F. Yancey and S. W. Parr made a plea for careful classification of coals on the basis of the character of the sulphur as well as the quantity present. Particular attention should be given to the reduction in sulphur which can be

made by washing, if the coal is to be properly evaluated with reference to its coke-making character. Professor Parr also reported another manuscript on the distribution of ash in the coal seam. He pointed out the importance of ash determination in the various sizes of coal. The increase of ash in smaller sizes results not alone from the greater amount of fine floor and roof material included by the miner but also from the fact that lump coal when broken up will produce fine material of higher ash content than the coarser pieces resulting from the same grinding. The bright coal contains more ash, the dull bands or "attritus" contain intermediate quantities of ash, and the mother coal the highest percentages of all, according to the results presented.

MADISON, WISCONSIN
Two of the four encircling lakes visible in the distance

The loss in heating value during heating of coal during storage was discussed by J. F. Byrne and J. D. Davis. These experimenters have used a calorimetric laboratory method which gives results independent of the gain or loss in weight during oxidation and storage. It is believed that this method is superior to the other, because the oxygen absorbed by coal during storage often obscures any effect of the loss of hydrocarbon content.

Another report by J. D. Davis discussed the calorimetric apparatus which he has designed for the measurement of heat of carbonization of coal at high temperature. A twin calorimeter permits high precision at temperatures up to 650 deg. C. This work is of particular importance, because very small heats of reaction are measured in this work. The author concludes that the maximum heat required for the primary carbonization of coal is approximately 30 calories per gram when carbonized in an atmosphere of nitrogen and even lower than this when carbonized in an atmosphere of hydrogen.

Catalytic Enrichment of Water Gas

The formation of methane by interaction of CO and hydrogen by catalysis with nickel was described by R. T. Haslam and H. O. Forrest, who reported an extended experimental research. The importance of this work is the possibility of enriching blue water-gas to sufficiently high B.t.u. per cubic foot by this reduction to eliminate the necessity of carburetion with oil. The result presented by the authors show the most desirable temperature to be between 325 and 375 deg. C. Increase in pressure has little effect on the gas produced. At atmospheric pressure and 325 deg. C. a gas containing 40 per cent methane with a heating value of 520 B.t.u. per cubic foot was obtained. Under these conditions the energy loss in the process was 20 per cent. At 330 deg. the minimum time of contact to give equilibrium was found to be 3 seconds. No carbon was deposited in the furnace and the catalyst was unaffected after passing 70 liters of gas over 10 grams deposited on kieselguhr brick.

The relative usefulness of various domestic fuels was discussed by G. G. Brown and John Bloomberg of the University of Michigan, who described tests of twenty-three domestic heating plants operated by householders under their supervision. Another report from the same institution was by J. C. Geniesse and E. J. Soop, who discussed the corrosion of Monel metal calorimeter bombs.

Agricultural and Fertilizer Divisions

Fertilizer Problems, Factory Scale Investigation of Refining Coconut Oil and a New Colloid Mill Reported at These Sessions

ONE of the outstanding features of the program of the Division of Agriculture and Food Chemistry and the Division of Fertilizer Chemistry was a joint symposium on the subject of soils, fertilizers and crops, under the chairmanship of H. A. Noyes. In this program there were discussed the relationship of plant development and crop yields to soils, soil improvement and fertilizer use. The problems of plant feeding by fertilizers and factors of effecting the physical conditions of soils were all considered.

Among the most interesting of the agricultural division papers was a report on a factory scale investigation of the refining of coconut oil and the manufacture of coconut butter by A. P. Lee. This test included refining of about a million pounds of coconut oil with an average free fatty acid content of 2.58 per cent (lauric), which was neutralized, washed, dried, bleached, pressed in hydraulic presses for separation of higher-melting fractions and those fractions deodorized. Careful records were kept of weights and analyses, showing a production of approximately 35.75 per cent hard butter with a setting point of 26.68 deg. C., 57.33 per cent light oil, 5.5 per cent acid oil and net shrinkage of 1.38 per cent. In conclusion, the results are said to compare favorably with usual practice in vegetable oil refining, but to be subject to further improvement at several stages of the process.

A new colloid mill and its application to the determination of sugars in dried fruits described by R. A. Dutcher and J. F. Laudig. Photographs were shown describing the construction of an inexpensive colloid mill in which sticky and gummy substances may be

ground in the presence of water or other solvents without loss of material. With this mill it was possible to grind weighed samples of raisins and determine the invert sugar by the refractometric method in less than 20 minutes and with sufficient accuracy to make the method valuable in the commercial grading of dried fruits. The possibility of using the mill in the laboratory preparation of colloidal preparations, and the rapid maceration of plant, drug and animal materials was also pointed out.

Other reports of industrial interests were the discussion of selenium solutions as spray materials by F. M. Lougee and B. S. Hopkins; the basic arsenate of calcium by H. V. Tartar, Lillian Wood and Elizabeth Hiner; hydrogen swells and oxygen in canned fruits by Edward F. Kohman and N. H. Sanborn.

Division of Physical and Inorganic Chemistry

Preferential Hydrogenation and Importance of Hydrogen-Ion Concentration in Colloid Precipitation Among Important Points Brought Out

A FEW of the outstanding points brought forth in the papers presented are of more than passing interest. Dr. Richardson and assistants of the research laboratory of Procter & Gamble Co. presented a piece of work on catalysis in which the preferential hydrogenation of only one double bond in an acid containing two double bonds was secured in a mixture of acids in contact with nickel. Wightman, Trivelli and Sheppard of the Eastman Kodak Co. presented two papers of scientific interest on photographic sensitivity. Electrolytic oxidation and reduction are closely related to overvoltage. This phenomenon is really more complicated than is usually thought, as was shown by W. D. Harkins. A large number of colloid papers was presented, from which one conclusion may be drawn, that, in precipitation of colloids, adsorption by colloids, etc., the p_H is the most important single factor, although the specific character of the ion and colloid must both be taken into account. McBurney and France found that a suitable amount of a protective colloid such as white lead is of great value in increasing the fineness and evenness of distribution of electrolytic white lead. Plaster of paris will set much faster by using alkali halide and other salt solutions. Harry N. Holmes showed that the rôle of sugar in jelly making was the dehydration of the pectin. By the use of dehydrating agents he was able to make good gels in alkaline solutions.

Division of Sugar Chemistry

Discussion Centered on Vegetable Chars or Activated Carbons Versus Bone Black, Plant Operating Standards, and Maltose From Cornstarch

EXACT control is of great importance in the sugar industry, so naturally this division of the society gives much attention to papers on analytical problems. The Milwaukee meeting was no exception, for about half of the program was given to such papers. However, the work is of great industrial importance in a number of cases, especially in those where the analytical procedure as modified permit increased speed or dependability in factory control.

Color removal as well as color measurement engaged attention and created much discussion in the section. Particularly the question of the value of vegetable chars or activated carbons as compared with bone black developed much argument. It was pointed out by some of the speakers that with a very narrow margin of profit in refinery operation or in manufacture of "plantation-white" sugar there is distinct advantage for bone black. However, it seemed to be the general opinion of those discussing the subject that the future offers attractive possibility for the activated carbons.

Automatic testing to evaluate chars of various sorts was discussed by W. D. Horne and E. W. Rice, who described a very ingenious laboratory apparatus for this purpose. Using this equipment, a sample of the solutions from the plant can be automatically put through a small-scale char filter which delivers the decolorized solution in successive bottles so that subsequently the chemist can test the color of the first, the second, the third and succeeding portions which have passed through the filter in order without having given the apparatus any attention in the interval.

Horton and Sengson contributed a note on the comparative ash adsorption of vegetable and bone chars. In this work they pointed out the superior ash removing character of the bone char if figured on an equal volume basis, but pointed out also that considered on an equal weight basis the vegetable char seems to approach in efficiency the bone char as an ash remover. These authors point out that the variation in test results previously recorded by various workers probably has come about more througn different methods of comparison and different laboratory test procedure than through any fundamental difference in the behavior of the various chars with the sugar solutions.

An extremely interesting discussion of plant operating standards for increasing speed and efficiency of plants was presented in a paper by H. W. Dahlberg, of the Great Western Sugar Co. This company has found that comparison of plant efficiency, both in output per man-hour and in purity of sugar, results in a competitive spirit between plants that is of great industrial value. In the opinion of that author, the average output in the United States is approximately one 100-lb. bag of sugar per man-hour. The average of all this company's plants is a bag per 36 minutes and the best plant of the company has increased the output to one bag per 29 minutes.

J. J. Willaman and associates at the Minnesota Agricultural Experiment Station have investigated various cornstalk sirups. They conclude that the question is far from settled and that problem still is the selection of a suitable variety of corn for both canning of corn and sirup production. With high quality sirups of this type excellent cooking sirup, rivaling sorghum and molasses, can be made; but in general a table sirup cannot be expected. The authors point out that the ratio of the apparent total solids content measured by brix and measured by refractive index method gives an indication of the real purity. If the ratio of brix to refractive index values is greater than 1.07, this indicates that the salt and other non-sugar content is too high to permit manufacture of a good sirup.

The manufacture of maltose from cornstarch was dis-

cussed by H. C. Gore, of the Bureau of Chemistry, whose work promises distinct improvements in the process for this purpose which had previously been discarded as impractical. The new results indicate that both maltose sirup and solid maltose can be made practically without the excessive cost previously incurred for the large quantities of the alcohol necessary in recrystallization. Previous optimistic estimates indicated $2 per pound as the lowest cost, but the refinements which on a laboratory scale are wholly successful in giving almost quantitative yield promise greatly to reduce this cost in commercial practice. As yet the modified method has not been tried out on a large scale.

Other reports presented to the section dealt with coloring matters of the rind of the purple cane by J. F. Brewster; observations on the hydrogenation of glucose by Horton and Geren, and notes of clarification of refinery sirups by J. Z. E. Perkins. Interesting analytical methods were discussed by a number of other authors. Adkins, Punn and Withrow discussed the influence of acid concentration on the determination of ash in sugars by the sulphate method; R. J. Brown and H. W. Dahlberg contributed a new precision method for the determination of dry substance in beet sugar juices; and G. H. Hardin and C. A. Browne discussed the influence of water-insoluble matter upon the polarization of raw cane sugars.

Division of Cellulose Chemistry

Discussion on Various Phases of Cellulose Chemistry Includes Interesting Symposium on Waste Sulphite Liquor

THE SESSIONS of the Cellulose Division will be particularly remembered for the animated discussions which followed each paper. This feature made the meeting very helpful to those who attended.

Considerable interest was shown in the method of determining cellulose in woods, there being three papers dealing with different phases of this subject. S. A. Mahood and J. L. Ebaugh, Jr., showed that it made little difference whether the temperature was 0 or 25 deg. C. E. C. Sherrard and G. W. Blanco presented a preliminary note on a water-soluble derivative of cellulose which apparently has been interfering with the determination of cellulose but which has not been previously recognized. They are to study this further. The whole discussion brought out the great need for a reliable method for determining cellulose, the present method being largely an empirical procedure which happens to have found common acceptance in the absence of anything better. The report of the analytical methods committee of the Cellulose Division will probably clarify this situation to a considerable degree.

On invitation of the division Dr. R. W. G. Wyckoff of Washington spoke on "The Usefulness of X-Ray Diffraction Methods in the Study of Cellulose and Related Compounds." This was a particularly interesting paper because the method has already been applied to a limited extent in the comparison of cellulose from different sources and Dr. Wyckoff gave a very clear picture of its possibilities and limitations in this connection.

R. H. McKee and D. E. Cable called attention to the possibility of a liquid sulphur dioxide process for sulphite pulp. G. A. Richter pointed out the desirability of complete penetration of the wood by the combined sulphur dioxide in the sulphite process and described the best conditions for obtaining this penetration, worked out as a result of extensive experiments.

Further study of the chemical changes in groundwood during decay was reported by M. W. Bray and T. M. Andrews. G. J. Ritter and L. C. Fleck presented further results of their extended work on the chemical differences between heartwood and sapwood, the present contribution practically completing the work.

The paper by A. W. Schorger on "The Gelatinization of Lignocellulose" opened up the always live question of the constitution of the cellulose molecule and started a discussion which was stopped only by the approach of the hour for dinner.

The symposium on waste sulphite liquors brought out many points in connection with present and proposed methods of handling this problem. R. H. McKee suggested a new method of fermentation followed by evaporation and burning of the residue as fuel.

The committee on the standardization of a viscosity method reported that a number of the leading manufacturers and users of cellulose ester solutions had already adopted as standard the method suggested by the committee. An apparent need had arisen for a modification or alternative to be used with solutions of low viscosity and the committee is to take this under consideration.

At the election of officers, the following were re-elected: Chairman, Gustavus J. Esselen, Jr.; vice-chairman, Louis. E. Wise; secretary-treasurer, L. F. Hawley; member executive committee, Harold Hibbert. As second member of the executive committee A. W. Schorger was elected.

To Develop Information on Ferrite

Ferrite is the metallographic constituent, iron, which forms the basis of all steels. Hence any advance in our knowledge of its characteristics is of interest and also of some possible technical importance. The crystal grains of ferrite often show a peculiar network within the individual grains after various types of etching for revealing the microstructure. This gives the material the appearance of being of a very fine-grained structure, which, if true, would greatly affect its properties.

During the past month the Bureau of Standards has devoted some time to the study of the phenomenon which has been noted by other observers, although no explanation of its nature has ever been suggested. The work has not yet been completed, but the results so far obtained indicate that this peculiar feature in the structure of ferrite is not related to the ordinary crystalline structure as it exists at room temperatures. When ferrite is heated sufficiently, it undergoes an allotropic change. Some evidence has been obtained indicating that when the iron is cooled from a high temperature all evidence of the structural condition existing at that temperature is not entirely erased, but persists as a pattern superimposed upon the ordinary structural arrangement. When the iron is reheated to a sufficiently high temperature, although considerably below the temperature at which the allotropic change takes place, the characteristic network previously mentioned results, but upon continued heating this is wiped out as equilibrium is obtained. Further work is in progress to show more clearly in what these changes consist.

Sidelights on the Exposition

A Ramble Around the Show with "Chem. & Met."

ONE of the most interesting features of the exposition was the large and varied assortment of instruments and devices for recording, indicating and controlling the operation of processes and process equipment. Each year the exhibits of this nature have increased, until with this show the line is so complete that the needs of anyone, no matter how difficult his problem may be, would seem to be capable of solution. These devices range from the simple indicating thermometer to the most complicated and delicate of electrical recording and controlling instruments.

A visitor's whole time could have been profitably spent in a study of this equipment. And even that would do no more than give a faint idea of the possibilities in better, cheaper and more closely controlled production which it makes available to industry. However, if the interest displayed by many is any indication, some of our industries are going to reap a harvest of increased efficiency from their increased use of the instruments displayed at this show.

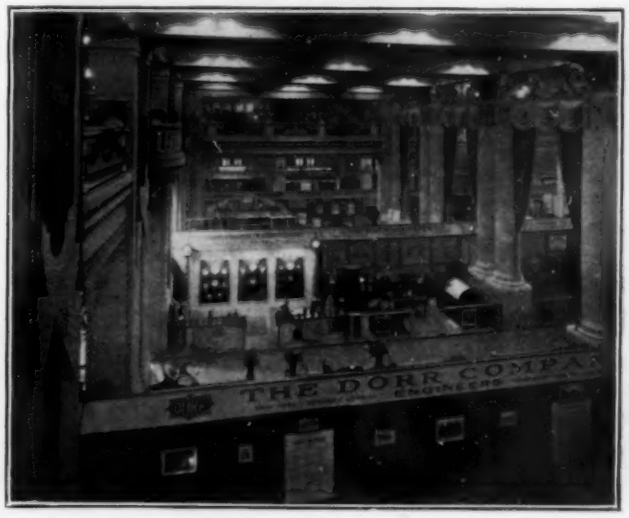
IF IT IS IMPORTANT to make chemicals, it is also important to have containers in which they may be shipped and stored. And of all containers, there is none of wider utility than the barrel. Barrels, like the poor, are always with us—some good, some bad, and some betwixt and between. And this year the Associated Cooperage Industries of America showed for the first time at a Chemical Exposition the tongued and grooved barrel.

After a close inspection of this product, we think it decidedly belongs in the class of good barrels. It is made with tongued and grooved staves, the tongue matching the groove the entire length of the stave. This makes of it a tight package—a package which is sift-proof and is particularly recommended by the makers for such products as dyes, powders, emery, pastes and plastic materials. Furthermore, it is made of light wood, being much lighter than the old-style, so-called "tight" barrel, which had to be made of heavy wood in order to be leakproof under handling. And finally, it is available at about one-fourth the cost of the "tight" barrel. This last quality carries a message that needs no code book for translation.

WHILE ON THE SUBJECT of barrels, another notable development first put before the general public at this show is worthy of attention. The Fessenden Co., of Townsend, Mass., has perfected and is marketing a barrel which it calls the "Sanitite." The feature of this barrel is that instead of having the staves dried and the bend set by fire, the process is now carried out in a drykiln. It is claimed that by this process the bend in the stave is set permanently and there is no danger of warp or shrinkage.

Because of the use of the drykiln, there is no char or dirt on the inside of the staves. For this reason the barrel is put forward as being particularly suitable as a container for such liquids as chemicals, fruit juices and sirups, vinegar and such other materials as the maker is anxious to deliver to his customers in a clean and sanitary condition.

THE BAILEY METER CO. of Cleveland, Ohio, exhibited a very complete line of indicating and recording instruments, for such varied items as pressure, temperature, flow of solids, liquids and gases, density, gravity, draft and speed. This last instrument is a new item in the company's line. It is an indicating and recording tachometer which is actuated by the suction created by the centrifugal force of a column of



Two Views on Main Floor

When the visitor looked from the gallery these are some of the interesting and varied booths that met his eye

air in a tube rotating about its center. This suction is applied to the inside of an oil-sealed bell, which actuates the pointer or the pen as the case may be.

The tachometer, as designed, records speeds of from 1,000 to 2,000 r.p.m. By the use of various step-up and step-down gears which the makers also supply, the range may be adjusted to fit any speed ordinarily encountered from that of the slowest stoker to that of high-speed turbines. To insure accurate results, in spite of variations in temperature and barometer, a device is installed to keep the density of the air in the tachometer always constant.

AN INTERESTING ACCESSORY to the centrifugal was shown at the booth of the Tolhurst Machine Works. This is called the "Timer" and is an electrically operated device which attaches to one of the side braces of the machine. As it consumes little current, it can be connected to an ordinary lighting circuit.

The device can be set for any number of minutes that the machine is desired to operate. When this time is completed, the "Timer" automatically turns off the power, sets the brakes on the centrifugal, and so stops the machine. At the same time a signal lamp is lighted to warn the operator that the machine has finished its task and that it is time to empty it. This serves the purpose of permitting materials to be treated in accordance with an exact schedule without necessitating the continual attendance of the operator.

AN AUTOMATIC electric arc welding machine and a table on which were exhibited parts repaired by welding attracted much attention at the booth of the General Electric Co. Every welding demonstration seemed to be attended with breathless interest on the part of the spectators. Perhaps this quick, easy and inexpensive method of making repairs and building special equipment on the job is at last to come into its own. Let us all hope so, for there is no more useful equipment for industrial plants than a welding set; and an experienced welder can do things with this equipment that are truly astonishing.

WHATEVER PAST Chemical Expositions may have brought in the way of novelty, this last one did not bring much. So it was with real pleasure that many stopped at the booth of the Orville Simpson Co. to inspect its new "Rotex" sifter. This sifter acts upon a new principle. The screens are double, and between the two parts are retained a number of balls and bevel strips in accordance with an arrangement that has been found to be most successful. The motion of the sifter keeps these balls and strips moving in such a way that they impart a vibration to the screens and at the same time develop a suction sufficient to keep the screens from becoming clogged by the fines. This sifter is recommended for use with fine and coarse chemicals, earths, powders and similar materials. It has already been in use for some months and its makers claim that it has been highly successful.

Where "Chem. & Met." Kept Open House

THE A.C.S. TOLD a worth-while story in its exhibits—told it simply and directly: "Research Pays." In putting its message across, exhibits were shown demonstrating approximately five centuries in the development of artificial lighting equipment from the early Venetian lamp to the final Mazda. The story of artificial silk by the viscose process, now fairly well known

among technical men, was included as further evidence of what research is doing. That the breadmaking industry has profited enormously, that the savings in scientific treatment of water for use in industrial processes is amounting to millions of dollars annually, that the sugar industry is in the van of those which are profiting handsomely through adequate research, that waste products are capable of yielding desirable compounds (e.g., furfural from oat hulls)—these were the ideas conveyed in this group of exhibits. A worth-while message well put across.

WHENEVER A METAL or alloy with new properties is found, its application benefits many industries, and whenever a metal we have thought of as rare becomes a commercial possibility the same effect is produced. Therefore, the new metals in the exposition are an interesting indicator of progress.

A look at the exhibits revealed a large number of new alloys and newly usable elementary metals and the total number of metals on exhibition and incorporated in instruments or machines exhibited was really surprising. We counted thirty and it is probable that we missed some of them.

TELLURIUM, SELENIUM and zirconium were exhibited as useful in the manufacture of radio detector crystals. To be sure, the tonnage consumed is small, but the more insight we get into their behavior in such service the more we shall know of their peculiarities under the influence of high-frequency electric currents. These same peculiarities will probably be of great industrial value some day. At present doctors disagree even as to whether there is any one property that gives them this peculiar power of rectifying small alternating currents.

SOMETHING BRIGHT to catch the eye would have been a good description of the exhibit of the Nash Engineering Co. The shining golden glitter of the all-bronze Nash Hytor Air Compressor, which formed the central attraction at this company's booth, was a magnet for all eyes. And those that stopped there were rewarded by the chance to inspect an extremely interesting line of compressors, vacuum pumps and other equipment.

JUST TO KEEP those attending the exposition from feeling homesick, the Anti-Hydro Co., in demonstrating its concrete and stone preservative, filled small tanks with various solutions which provided a smell for everyone, be he tanner or bleach producer.

PROBABLY THE TWO MOST INTERESTING alloy exhibits were those of Hybnickel and Calite. In both cases there was shown a specimen tube that had been subjected to very severe conditions for a great length of time with surprisingly little effect.

Chemists' Club Had Good Neighbors

THE LESS ARISTOCRATIC METALS lead and antimony appear in another exhibit as Chemetal. This is an acid-resisting alloy that seems to present commercial possibilities in the form of valves, pumps and various castings.

RUGGLES COLES, in demonstrating the Hardinge mill, while not departing from the usual idea in exhibiting a model, still made a very clean-cut job of it and demonstrated in a very understandable manner the exact manner of operation of this equipment. Nuts, beans and bran had a fine chase in a glass conical mill to demonstrate how material is segregated.

WHAT THE RELATION of the hookworm is to the Eastman Chemical Co.'s products was made clear to us for the first time. This company is now making a carbon tetrachloride which is sufficiently pure to be used as a specific in treatment in this malady of the South. Many rare chemicals, the new small-scale moving picture camera and projector—these and other distantly related items went together to make an interesting booth if one not of primary or fundamental concern to the chemical engineer.

WE MUST HAVE our annual mystery at the exposition. This year it was found in the Premier Mill exhibit. Information to the effect that the only large-scale unit of this apparatus was not available came as a distinct disappointment. Tests are said to have demonstrated very many remarkable applications of this equipment throughout the chemical engineering industries. Of course it is the part of the engineer to be from Missouri, but here's hoping.

THE MOVING MODELS held the crowds in many places. The old childish impulse to watch the wheels go 'round is apparently still strong within us. A good place to study the chemical engineer taking a day off! Of the many small-scale moving exhibits telling a definite story, those of the Sandvik steel conveyor belt and that of the Young Brothers' continuous core drying oven were a couple that we noted especially.

A GLIMPSE into one corner of a paper mill was afforded in a two-piece exhibit of the Vallez Rotary Filters Co., in which a small-size beater worked up pulp for drying in the new model of the Improved Paper Machine Co.'s rotary filter. This reminds us of one of the few small-scale model plants in evidence at the exposition, that of the Mathieson Alkali, showing "the makings" of chlorine and caustic.

THE FANSTEEL PRODUCTS CO. had an exhibit of metallic tantalum showing many of its uses which undoubtedly put valuable ideas into the head of many a visiting engineer.

Why Should You Bother About
The Mechanism of Catalysis?

This Article Is an Account of the Present Status of Our Knowledge as to How Catalysts Work, With Especial Emphasis on the Industrial Significance of the Subject

By H. W. Underwood, Jr.
Department of Organic Chemistry,
Massachusetts Institute of Technology

A CATALYST is usually defined as a substance (element or compound) which changes the speed of a chemical reaction, either positively or negatively, or initiates a reaction without itself being changed in chemical composition at the completion of the process. Often the physical state of a catalyst is much altered by use. Only a small amount of a catalytic agent is necessary to transform large quantities of the reacting substances. A catalyst does not contribute energy to a reaction, and consequently in the case of a reversible reaction it does not change the point of equilibrium, but merely makes it possible to reach this stage in a shorter time. These criteria might be discussed at length, but such a procedure would be beyond the scope of this paper. It is sufficient to say here that the definition given above rests on ample experimental evidence, and is widely accepted.

Technical Importance of Catalysis

Many chemical reactions ordinarily proceed too slowly to be of practical use. The addition of small amounts of suitable catalysts may increase the velocity of such transformations enough to make them very valuable. Illustrations can be found in the use of very pure iron to accelerate the union of nitrogen with hydrogen in the Haber process for ammonia synthesis, finely divided nickel in the "hardening" of oils, anhydrous aluminum chloride for the "cracking" of petroleum, copper in the production of acetaldehyde from ethyl alcohol and in the formation of formaldehyde from methanol, platinum in the oxidation of sulphur dioxide to the trioxide for the manufacture of sulphuric acid and in the transformation of ammonia into nitric acid, porous iron oxide for the production of industrial hydrogen from water gas and steam, and for the purification of illuminating gas, lime and Twitchell's reagent in the hydrolysis of fats for soap production, sulphuric acid for the synthesis of isopropyl alcohol from propylene, and the dehydration of ethyl alcohol to make ether, various organic compounds in aiding the vulcanization of rubber, enzymes in production of alcohols, etc. Most of these processes are potentially or actually very important, and could not readily be carried out on an industrial scale without the use of catalytic agents. Our list of reactions in which catalysts take part might be enlarged sufficiently for us to conclude that the latter are most extensively used in the processes of all sorts, both organic and inorganic. A study of catalysis is the concern of every worker in the chemical engineering industries.

It is clear that an understanding of the mechanism of catalytic action will greatly facilitate the choice of a suitable catalyst as well as its efficient use for a given reaction. Until recently catalysis was regarded as an exceedingly mysterious phenomenon and its applications were carried out largely by empirical methods. Within the last few years, however, many fruitful attempts have been made to classify our knowledge about catalysts and to clarify and extend our hypotheses as to how they act. Investigations of this sort are being vigorously conducted at the present time by many workers. Interpretation of the results obtained so far has given us two main ideas as to the mechanism of catalysis, the physical or adsorption theory and the chemical or intermediate compound theory. Our discussion will perhaps be clearer if we consider the chemical theory first.

Chemical or Intermediate Compound Theory

Sabatier, a very eminent authority and worker in the field of catalysis and a pioneer in catalytic hydrogenations, believes that catalytic agents function by the formation of temporary, unstable intermediate compounds with one or more of the reactants of the system ("La Catalyse en Chimie Organique," 1920, pp. 49-66). It is supposed that these intermediate compounds break down almost immediately with the regeneration of the catalyst chemically unchanged and the formation of the products of the catalyzed reaction. The catalyst now again forms an intermediate compound and the cycle of changes is repeated. It is obvious that the production and decomposition of these intermediate substances must proceed very rapidly indeed. By means of this theory the behavior of platinum as a catalyst of oxidation might be explained by saying that the metal forms an intermediate unstable peroxide. If we designate the substance being oxidized as A, we can describe the process by the following equations:

$$Pt + O_2 = Pt < \begin{matrix} O \\ | \\ O \end{matrix} \; ; \; Pt < \begin{matrix} O \\ | \\ O \end{matrix} \; | \; + 2A = 2AO + Pt$$

There is considerable evidence to support the idea that platinum acts as an "oxygen-carrier" in this way.

Definite Intermediate Compounds

As yet it has not been possible to isolate a peroxide of platinum in reactions where this metal serves as a catalyst of oxidation, although the compounds PtO_2 and PtO are known (Mellor, "Modern Inorganic Chemistry," 1920, p. 643). In some cases, however, catalytic processes have been conducted in stages and the nature of the intermediate product thereby determined. For example, Williamson [*Ann. Chim. Phys.*, (3) vol. 40, p. 98 (1854)] has demonstrated that when ethyl alcohol is heated with sulphuric acid it is converted into ethyl hydrogen sulphate,

$$C_2H_5OH + H_2SO_4 = C_2H_5 \cdot HSO_4 + H_2O$$

If this sulphate be heated with more alcohol, diethyl ether is formed,

$$C_2H_5 \cdot HSO_4 + C_2H_5OH = C_2H_5.O.C_2H_5 + H_2SO_4$$

These facts show clearly the way in which a small amount of sulphuric acid will catalyze the dehydration of large quantities of ethyl alcohol.

The oxidation or dehydrogenation of methanol by air in the presence of metallic copper is accompanied by characteristic cyclic variations in the color of the surface of the copper. This phenomenon is interpreted as indicating continual changes in the state of oxidation of this metal. In other words, the surface of the copper acts as an "oxygen-carrier."

In the catalytic transformation of carbon monoxide into the dioxide by air through the use of a mixture of the oxides of cobalt, manganese, silver, etc., it is said that there is alternate or practically simultaneous reduction and oxidation of the catalyst. The latter oxidizes the carbon monoxide, and is itself reoxidized by the air. A similar explanation has been given for the oxidation of naphthalene to phthalic acid by air or oxygen in the presence of molybdenum or vanadium oxides.

The illustrations of catalytic action which have been given include reactions that take place in homogeneous systems and those that occur in heterogeneous systems. In each case the catalyst apparently takes part in the cyclic formation and decomposition of unstable intermediate compounds. The specific action of various catalytic agents depends largely on suitable instability of the intermediate complex, or in other words, it rests on the coincidence that the catalyst and the initial material will interact to form a compound sufficiently unstable under conditions prevailing to decompose (or interact with other constituents of the system), giving new products.

The mechanism of catalysis in homogeneous systems is satisfactorily explained by the chemical or intermediate compound theory, in support of which new evidence is constantly being brought forward. At this point it may be worth while to point out that the search for a catalyst suitable for use in the oxidation of naphthalene by means of air (*J. Ind. Eng. Chem.*, 1922, vol. 14, p. 120) involved the study of the effects produced by compounds of many elements capable of forming several oxides, or in other words, of acting as "oxygen-carriers." The ability of aluminum chloride to bring about decompositions and syntheses of organic substances through the formation of intermediate compounds was well known for some time before this chloride was employed for cracking petroleum. (*J. Ind. Eng. Chem.*, 1915, vol. 7, p. 737.) These two illustrations are perhaps typical of the many cases in which the chemical theory of catalysts may well have served as a guide in the choice of catalysts.

Indefinite Intermediate Compounds

In many cases of catalytic action, however, and especially in certain ones which take place in heterogeneous systems, an explanation of the behavior of the catalyst on the basis of the chemical theory necessitates the postulation of intermediate compounds which have not been isolated and about the chemical composition of which there is much doubt.

Sabatier ("La Catalyse en Chimie Organique," 1920, pp. 59-60) considers that catalytic hydrogenation by the use of finely divided metals such as platinum, copper or nickel is best explained by assuming the formation of unstable metallic hydrides. He states that palladium actually forms in the cold a definite complex with hydrogen, which possesses a feeble tension of dissociation. Hydrogen adsorbed on palladium will reduce nitrates to nitrites and forms water when placed in contact with atmospheric oxygen (Boettger, *Ber.*, 1877, vol. 6, p. 1396). This metal, however, is not so good a catalyst for hydrogenation as platinum, probably because the palladium does not give up its hydrogen rapidly enough. Sabatier states that catalytic nickel acts as though it were covered with a layer of unstable hydride to which he assigns the formula $Ni < \begin{matrix} H & Ni\text{-}H \\ or & | \\ H & Ni\text{-}H \end{matrix}$. The hydrogenation of ethylene by the use of finely divided nickel might be written thus: $H_2 + Ni_2 = Ni_2H_2$; $Ni_2H_2 + C_2H_4 = C_2H_6 + Ni_2$. If this hydride theory regarding the action of metals is correct, such catalysts of hydrogenation should also be capable of removing hydrogen from compounds, under suitable conditions. This is found to be the case.

A serious defect in the explanation of catalytic action by postulating the formation of intermediate compounds which have not been isolated is the vagueness of the stoichiometrical relationships which are involved. No one has yet offered substantial proof for the existence of nickel hydride. It is possible that organic compounds subjected to hydrogenation in the presence of catalytic nickel may form unstable combinations with the latter (Armstrong and Hilditch, *Proc. Roy. Soc.*, London, 1919, vol. 96A, pp. 137, 322). Such a phenomenon, rather than metallic hydride formation, might be used to explain some cases of catalytic hydrogenation. It is well known that kaolin will dehydrate ethyl alcohol very efficiently. The production of kaolin ethylate as an intermediate step in this process seems somewhat improbable. Bancroft (*J. Ind. Eng. Chem.*, 1922, vol. 14, pp. 444, 545, 642) points out that oxygen adsorbed by charcoal will oxidize ethyl alcohol to acetic acid and ethylene to carbon dioxide. He considers that such reactions are surely not due to any known oxide of carbon. Numerous other examples might be given to show that in many cases the possible intermediate compounds are very indefinite.

In view of these facts some investigators, and especially those who are physical chemists, have contended that explanations of this sort are empirical and useless in portraying the mechanism of the reactions with which they are concerned. They have proposed that in such cases of heterogeneous catalysis the chemical theory should be replaced by a purely physical concept, whereby the catalyst is to be regarded as promoting chemical

"Something for Nothing"

The nearest we shall ever come to getting something for nothing is in the use of the amazing class of substances known as catalysts—"to increase the speed of chemical reactions without themselves being affected." These reagents have ceased to be merely mysterious; they are vital parts in the industrial community. The mechanism by which they operate is of great importance, for when it is understood, better catalysts and better yields will result. Better yields mean lower production costs. It is therefore not only "something for nothing" but "more for nothing."

changes solely by the adsorption or surface concentration of one or more of the reactants. This idea forms the basis of the so-called physical or adsorption theory. In determining whether this explanation is valid we shall have to ask, Is adsorption a physical or a chemical phenomenon?

Physical or Adsorption Theory

We may begin our discussion of this topic by considering the physical conditions that are found in operations where catalysts perform their functions in heterogeneous systems, with especial emphasis on cases in which a solid catalytic agent is in contact with reacting materials in a gaseous or vapor phase. Faraday noted that the clean surface of metallic platinum when placed in a mixture of hydrogen and oxygen attracted these gases by virtue of some unknown force. As a result of the process the metallic surface became covered with a layer of hydrogen and oxygen in which the concentration of these materials was very much greater than in the surrounding gas mixture. A phenomenon of this sort is called adsorption or surface condensation. It occurs to a greater or less extent whenever gaseous or liquid materials are in contact with the surface of a solid. In his book on "Applied Colloid Chemistry" (1921), Bancroft has collected considerable data on adsorption by various substances. Charcoal is a very good adsorbent. One volume of synthetic charcoal will adsorb at +20 deg. 7.3 volumes of hydrogen, 12.6 volumes of argon, 197 volumes of ammonia and 304.5 volumes of chlorine[1] (volumes probably corrected to 0 deg. and 760 mm.). Finely divided metals also adsorb gases to a certain extent, and are very selective in their action. Mossy palladium adsorbs 680 to 850 volumes of hydrogen.[2] Platinum black may take up 100 volumes of hydrogen.[3] Finely divided silver and gold adsorb oxygen.[4] Taylor[5] has studied the adsorption of several different gases by catalytic nickel on a porous support. He finds that at 175 deg. and atmospheric pressure 1 gram of this metal will take up 5.2 c.c. of hydrogen, 5.6 c.c. of carbon monoxide and 6.5 c.c. of ethylene (gases measured at 0 deg. and 760 mm.). Experiments made by various investigators show that silica, alumina, glass, etc., possess the power of adsorbing gases. It has been stated that certain unsaturated compounds are adsorbed by clay and oxygen compounds by oxides of silicon, titanium, iron and aluminum (Rohland, *Zeit. Anorg. Chem.*, 1909, vol. 65, p. 108). Our list of examples of adsorption might be greatly extended, but those already given are sufficient to indicate the wide occurrence of the phenomenon. It enters into all catalytic processes which involve a heterogeneous system.

Relations Between Adsorption and Temperature and Pressure

Generally adsorption increases with a lowering of temperature. One volume of coconut charcoal will take up fifteen volumes of nitrogen at 0 deg. and 155 volumes at —185 deg. (Dewar, *Proc. Roy. Soc.*, 1904, vol. 74, p. 124). Adsorption is accompanied by an evolution of heat and a great decrease in the volumes of the gases taken up. According to an estimate by Mitscherlich, when carbon dioxide is adsorbed by wood charcoal at 760 mm. and 12 deg., it occupies only one fifty-sixth of its original volume. It is therefore supposed that the carbon dioxide is liquefied during the course of the process. The apparent density of some gases adsorbed by coconut charcoal has been considered by Dewar (*Proc. Roy. Soc.*, 1906, vol. 18, p. 438). He gives the density of carbon dioxide adsorbed at 15 deg. as 0.70, while the density of the liquefied gas would be 0.80. The density for hydrogen adsorbed at —193 deg. is stated as 0.06 as compared with 0.07 for the liquefied gas. The same investigator points out that for hydrogen the molecular heat of adsorption at —185 deg. is more than six times as great as the corresponding heat of liquefaction (*Proc. Roy. Soc.*, 1905, vol. 23). Other gases, such as nitrogen and oxygen, showed heats of adsorption larger than those of liquefaction. Similar conditions are found in the adsorption of hydrogen by platinum and of ammonia, carbon dioxide, sulphur dioxide, hydrogen bromide, etc., by charcoal. [Favre, *Ann. de Chim. et de Phys.*, (5), vol. 1, p. 209 (1874).] Lamb and Coolidge have studied the heats of adsorption of the vapors of certain organic liquids by charcoal and conclude, through an assumption that the net heat of adsorption is a heat of compression, that the attracting force is about 37,000 atmospheres when 1 c.c. of liquid is adsorbed by 10 grams of charcoal. (*J. Am. Chem. Soc.*, 1920, vol. 42, p. 1146.)

A consideration of the usual effects of temperature and pressure may well lead us to ask whether these two factors, together with surface concentration on the adsorbent, are not the cause of the results produced by catalytic agents acting in heterogeneous systems. Recent investigations seem to indicate that this question must be answered in the negative. It has been found that an oxygen-hydrogen gas mixture is stable under a pressure of 2,000 atmospheres in the absence of a catalyst. Moreover, if catalysis in heterogeneous systems were due merely to a sort of capillary action by which the reactants were concentrated at the surface of the catalyst and subjected to high temperatures and pressures, we should expect that all good adsorbents would also be efficient catalysts. Experimental results do not support this idea. Charcoal is a very good adsorbent for many gases, but it is useful as a catalyst in only a few processes, of which the union of carbon monoxide and chlorine is an example. Patrick's silica gel is an excellent adsorbing agent, and yet it does not catalyze many of the reactions which are readily accelerated by platinum. It would be difficult to explain on a purely physical basis the varied decompositions of a compound such as isobutyl alcohol, which takes place when its vapors are passed over certain solid catalysts at a temperature of 300 deg. Finely divided copper yields isobutyric aldehyde and hydrogen, while alumina produces isobutylene and water, and manganese oxide gives isobutyric aldehyde and hydrogen (Sabatier, "La Catalyse en Chimie Organique," 1920, p. 48). Apparently the behavior of catalysts in heterogeneous systems is markedly specific, and we shall do well to consider whether evidence is available to explain their action (and therefore the effects of adsorption) on a chemical basis.

Experimental results obtained at Massachusetts Institute of Technology in a quantitative study of the heats of adsorption of hydrogen, chlorine and oxygen on charcoal support the views of Favre, who found that the heat of adsorption is dependent on the nature of the gas only, and is practically independent of the nature of the char-

[1] Hempel and Vater, *Zeit. Elektrochemie*, vol. 18, p. 724 (1912).
[2] Mond, Ramsay and Shields, *Proc. Roy. Soc.*, vol. 62, p. 290 (1897).
[3] Paal and Gerum, *Ber.*, vol. 41, p. 805 (1908).
[4] Neumann, *Monatsh.*, vol. 13, p. 40 (1892); Engler and Wochler, *Zeit. Anorg. Chem.*, vol. 29, p. 1 (1902).
[5] *J. Ind. Eng. Chem.*, vol. 13, p. 75 (1921).

coal. This could not be true if the force of attraction of the gas molecules for the charcoal were largely due to capillary effects, for then this force, and consequently the heat of adsorption, would depend on the size of the pores. Now the size of the pores can hardly be the same for all varieties of charcoal. Consequently the heat of adsorption must be due to some cause other than capillary forces. It would appear that adsorption is a mutual function of the chemical nature of the substance adsorbed and the adsorbent. The question now arises, Is the first stage of the adsorption of gas on charcoal identical with a chemical combination of the gas molecules with the molecular surface of the charcoal? Results obtained in the cases of oxygen and chlorine would certainly lend some support to this view. The bonds of these substances are disturbed in the adsorbed state. Experiments with hydrogen indicate that no chemical combination has taken place. It may be worth while to point out that charcoal does not act as a catalyst of hydrogenation. This is in accord with the purely physical nature of hydrogen adsorption. On the other hand, charcoal will catalyze certain oxidation reactions such as the transformation of ethyl alcohol into acetic acid and also processes which involve the use of chlorine, such as the union of carbon monoxide with chlorine to form phosgene.

The statements made in the preceding paragraphs indicate that although some cases of adsorption are undoubtedly purely physical, others (those involved in catalyses in heterogeneous systems) may involve molecular disturbances comparable with those occurring in chemical reactions and should be studied from this point of view.

OTHER METHODS OF ATTACKING ADSORPTION PROBLEMS

Langmuir[6] and Harkins[7] and Kruyt and van Duin[8] have investigated the adsorption of certain organic compounds in an attempt to learn how the molecules attached themselves to the surface of the adsorbent. In the case of ethyl acetate adsorbed on charcoal Kruyt and van Duin concluded that the ethoxy group is held on the carbon surface while the rest of the molecule projects out into space. Bancroft proposed that a mixture of the vapors of ethyl acetate, $CH_3.CO_2.C_2H_5$, and hydrogen be passed over heated catalytic nickel. Some of the initial decomposition products might thereby be reduced before they had a chance to react further. Consequently an examination of the substances resulting from this process should throw some light on the mechanism of the reaction. If methane and ethyl formate were formed it would be reasonable to suppose that the ethyl acetate molecule had split into CH_3-and-$CO_2.C_2H_5$. The production of acetic acid and ethane would indicate a decomposition of the ester into $CH_3.CO_2$-and-C_2H_5. In case methane, ethane, and carbon dioxide were found to be present at the end of the process, it might be concluded that the $CH_3.CO_2.C_2H_5$ molecule had broken simultaneously at three points. Taylor and Burns have measured the adsorption of hydrogen, carbon monoxide, carbon dioxide and ethylene by finely divided nickel, cobalt, iron, copper, palladium and platinum respectively. (*J. Am. Chem. Soc.*, 1921, vol. 43, p. 1273.) Adsorption in these cases was found to involve electronic rearrangements in both the catalyst and the adsorbed gas. Methods of preparation which produce good metallic catalysts also yield metals with high powers of adsorption for gases whose reactions they catalyze. Free evaporation of reactants and of resultants is necessary for chemical reactions. This research is significant as a contribution to our knowledge of adsorption from a quantitative point of view, and it may have some bearing on the chemistry of adsorption.

In conclusion it may be said that at present the Intermediate Compound Theory is suitable for explaining the mechanism of catalysis in homogeneous systems and in numerous other cases. This concept has been and still is very useful as a guide in the choice of catalysts for many industrial operations. Recent investigations point toward the evolution of a theory for certain instances of catalysis in heterogeneous systems heretofore not clearly understood whereby adsorption will be dealt with as a phenomenon which is both physical and chemical.

[6] *J. Am. Chem. Soc.*, vol. 39, 1848 (1917); vol. 40, 1361 (1918).
[7] *Ibid.*, vol. 39, pp. 354, 541 (1917).
[8] *Rec. Trav. Chim.*, vol. 40, p. 249 (1921); *Chem. Abs.*, vol. 15, p. 3783 (1921).

Initial Quality vs. Results in Carburizing Steel

At the suggestion of a group of metallurgists of the automobile industry, the Bureau of Standards has taken up the investigation of the carburization of steel, a problem of great importance in this industry. The specific purpose of the investigation will be to determine whether or not the initial quality of a steel influences to any marked extent the results obtained in carburizing practice, as has been claimed by some commercial metallurgists. Specimens of "normal" steels—that is, steels which in the hands of these metallurgists prove to be entirely satisfactory—and of "abnormal" steels, those which gave results of a decidedly different character when subjected to the same carburizing process, have been secured; and the preliminary work of cutting the samples, making examinations of the structure, etc., is now under way.

South to Produce Bauxite

Both white and red bauxite are found in large quantities in Henry County, Alabama. They are said to be the largest deposits of bauxite ever discovered in the Southern states. This bauxite was discovered by representatives of the Republic Mining & Manufacturing Co. and the Georgia Co. of Birmingham, Ala. These companies have men investigating other lands in that section of the state and are taking leases on lands that contain promising deposits of bauxite. It is learned that they now have under lease more than 1,000 acres of bauxite lands and that they expect to begin developments on a large scale as soon as they acquire all the leases desired.

Pottery Clay Industry Growing

Pottery clay is now being mined or quarried in thirty-three counties in California, and the industry during the past few years has taken on a decided impetus. The production for the year 1922, from official figures recently compiled by the State Mining Department, totaled $362,000 in valuation for the crude material at the pit, covering all clays used for the production of red and brown earthenware, chinaware, sanitary ware, architectural terra cotta, roofing tile, etc. It is pointed out that the ceramic industry of the state, as a whole, has been considerably neglected and that there is marked opportunity prevalent for advancement in this line.

Separation

Solids From Gases

The Article Published Below Is an Advance in the Technology of This Unit Process and as Such Is of Significant Interest to Production Men in the Chemical Engineering Industries

Application of Electrical Precipitation to Chemical Engineering Processes

Recent Developments Numerous—Byproduct Gas Cleaning—High Temperature and Acid Mist Apparatus

By P. E. Landolt
Research Corporation, New York City

MANY fundamental operations have been greatly improved by utilizing processes of electrical precipitation. Distillation, concentration, evaporation, fractional condensation, combustion, ventilation, crushing and grinding, drying, roasting and others are included. Specifically applications include sulphuric acid concentration, spray drying, tar and oil separation from byproduct operations, blast-furnace gas cleaning, ore roasting, ore drying and rock grinding.

So much has been written about these processes that it will be unnecessary in this article to present details of the theory and practice of electrical precipitation. For those not familiar with these processes a selected bibliography to which reference may be made will be found in *Chem. & Met.*, vol. 26, No. 4, page 152.

The phenomenon of electrical precipitation of suspended particles from gases has been studied from many viewpoints, but it became apparent to those interested in its commercial development that the vast amount of data, largely empirical, that had been accumulated over a long period must be properly correlated and co-ordinated and that the underlying theory must be proved in practice so that "theory" could be translated into useful engineering design data. This became necessary so that operating results could be accurately predicted and apparatus could be designed to be economical and to render the maximum service for the minimum expenditure.

Reference to an article by Evald Anderson in *Chem. & Met.*, vol. 26, No. 4, page 152, Jan. 25, 1922, indicates that if

a = gas volume to be treated
b = function of equipment and maintenance cost
c = value of solids treated
d = a function of the sp. ppt. rate

$$x = a\left(\frac{\log \frac{b}{c \log d}}{\log d}\right)$$

Certain fundamental data must always be had before such apparatus can be designed. These include quantity of gases to be cleaned or "treated" per unit of time, including temperature, pressure, density and composition of such gases; quantity as well as the properties and composition of the suspended material to be removed from the gases; available space, related operations and electrical power supply. Knowing the above "gas" data, it is now possible to predict accurately the size of the apparatus needed as well as the resultant efficiency of removal of the suspended matter. This determination is based on a rational equation which bears out the fundamental theories of electrical precipitation. To these determinations may be added a "factor of safety" in design which depends on operating conditions for the specific problem and is based

FIG. 1—H_2SO_4 RECOVERY FROM SLUDGE ACID CONCENTRATORS

FIG. 2—PLATE TYPE PRECIPITATOR USED IN AIR CLEANING

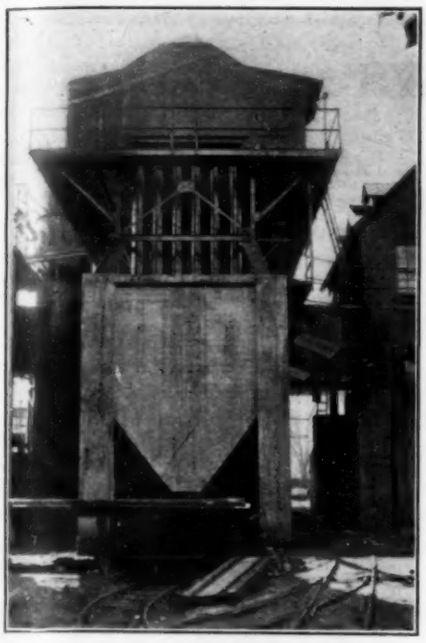


FIG. 3—PIPE PRECIPITATOR USED IN LEAD SMELTING

either on experience or experimental studies in the laboratory and field.

Materials Used in Construction

Knowing the size and type of installation necessary to "treat" or "clean" certain gases electrically, it is then necessary to select suitable materials and equipment for the construction of the apparatus. In the case of sulphuric acid problems, soft lead is used for essential parts of the Cottrell precipitation, such precipitation equipment being supported on a steel or wood supporting structure. Up to a concentration of 90 per cent H_2SO_4, lead is satisfactory, but for problems requiring the removal of stronger acid, steel is used. Up to 300 deg. F. the lead construction gives good service but only fair life and recently installations are being made of acid-proof masonry. To obtain proper operation in this latter case it has been necessary to use not only metallic high tension electrodes but metallic grounded electrodes as well. Also in the latter case, to facilitate the construction of such masonry, square pipes are used instead of the usual cylindrical type of "collecting electrode."

A careful study of various materials subjected to high temperature as well as gas corrosion, particularly SO_3, was necessitated by a problem of gas cleaning in connection with the roasting of zinc concentrates. Tests conducted over many months showed that certain ferrochromium alloys were best suited to these conditions—i.e., dust removal from such gases at 1,200 deg. F. The "precipitator" for such dust is carefully heat insulated to minimize temperature drop and the apparatus is gas tight. It was found that under such high-temperature conditions, vitreous materials, to insulate properly the high voltage current used, were not suitable, as they were fragile and cracked, due to unequal expansion. These failed under mechanical strain, occasioned by the operation of cleaning or removing the collected dust from the electrodes. Numerous tests showed that powdered lime could be used as a dielectric and "lime seals" were developed to replace other high-voltage insulators for high-temperature operations.

The saving of labor in connection with the operation of equipment becomes an important factor in design. This has brought about the development of automatic controls for the cleaning of the electrodes (in dust problems), for damper operation and for applying the high-voltage current to the apparatus. Such automatic devices are readily "interlocked" and "timed" to reduce the attention necessary to a minimum.

Where opportunities are presented for applications to similar operations, the idea of "standardization" becomes a factor and various operating parts of the equipment become "fixed" or "standard" as to design. For example, repeated determinations have been made to show the relation among electrode spacing, gas volume treated per unit of time, and efficiency of removal of suspended matter. Tests using various sizes of pipe from 1 to 24 in. diameter have been conducted as a result of these tests. Where pipes are used as collecting electrodes, 6 and 8 in. diameter pipes have become the "standard" sizes. Where plates are used as collecting electrodes, 4 and 6 in. spacing betwen plates has been adopted as "standard." These "standards" represent the mean of design considerations—i.e., between economy in materials and first cost, ease of operation and satisfactory efficiency.

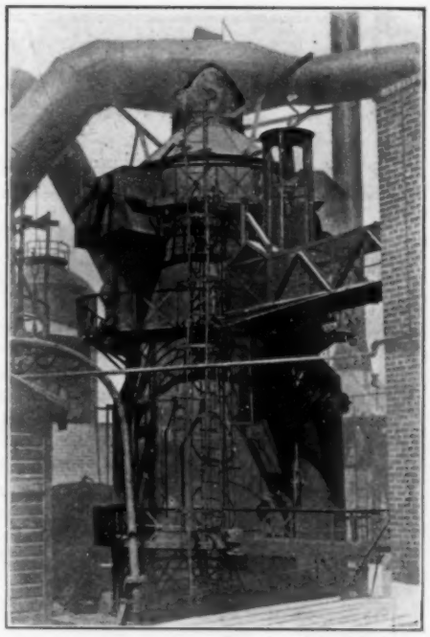


FIG. 4—TYPE USED IN REMOVAL OF DUST FROM HOT GASES

To the operating man the question of cost is usually a first consideration. In an article published in *Chem. & Met.*, vol. 25, No. 9, page 428, Aug. 31, 1921, a typical set of costs of Cottrell installations with operating costs was shown. Further developments and resultant standardization have reduced many of these costs as shown by comparison of the above-mentioned costs and those shown in the accompanying table. A study of this table shows a wide range of costs, but the applications indicated cover a wide range of operating conditions.

TYPICAL INSTALLATIONS—INVESTMENT AND OPERATING COSTS

	Metallurgical Fume	H_2SO_4 Mist Concentration	H_2SO_4 Mist, SO_3 Gases	Boiler House Gases (Powdered Coal)	Zinc Roaster Gases	Producer Gases (Detarring)	Spray Drying Solids Recovery
Investment per rated cu.ft./min.	$0.56	$1.80	$3.75	$0.11	$3.00	$1.28	$0.50
Temperature of gases treated, deg. F	500	250	70	300	1,200	100	150
Cleaning cost per 100,000 cu.ft./hr.	$0.05	$0.09-$0.10	$0.18	$0.01	$0.16	$0.11	$0.05
Power consumption, kw.-hr. per 100,000 cu.ft./hr.	0.75	1.00	0.67	0.25	0.55	0.88	0.56
Efficiency of removal of suspended matter, per cent	90–95	98	99.9 plus	90	95	95–98	95
Length of discharge electrode in feet per 100,000 cu.ft./hr. treated	360	115	150	170	280	100	280
Spacing plate to plate in inches (or pipe diameter)	6	8 Dia.	8 Dia.	4	8	6 Dia.	4

Equipment News

From Maker and User

Theft-Proof Electric Bulb

Much loss of property and time and considerable annoyance are caused by the practice of removing lighting bulbs from their sockets for theft or other purposes. In industrial plants this often results in a real menace, as accidents become more likely in the resulting dark places.

The new Kulp Theft-Proof Bulb, designed to prevent all such loss and danger, is just being placed on the market by Lester Kulp, 143 W. Austin Ave., Chicago. The simplicity of the idea

KULP THEFT-PROOF BULB

particularly recommends it, as there are no guards, locks, keys, springs, or other mechanisms. It is a standard lamp that fits into any standard socket—complete in itself—and looks and is used in the same way as any ordinary lamp. It carries no extra cost for theft protection, for it is to be sold at standard prices.

The illustration shows how the theft-proof feature is obtained. One contact is at the top just as in an ordinary lamp. The other contact is a brass ring, fastened at the bottom of a porcelain plug. This plug has a groove which is filled with plaster of paris, lightly holding the brass shell in place. After the lamp is screwed into the socket, an extra turn breaks the plaster of paris seal, so that the lamp can turn freely in the shell, always maintaining electrical contact. The shell, however, cannot be turned in the socket. The shell, being spun over the ring, screws up so close to the socket that fingers or tools cannot grasp it. Thus the lamp positively cannot be stolen or even broken in the attempt to steal it, thus preventing endangering circuits.

When the bulb is burned out, it can easily be removed for replacement. The bulbs come in any standard size, voltage or wattage.

Fig. 1—Hytempite being made into a pancake batter. To this will be added crushed old firebrick ¼ in. and under. This crushed brick will be poured into the batter and then thoroughly mixed and crushed firebrick will be added until the mixture is like molding sand.

One-Piece Lining for Brass-Melting Furnace

The method of lining oil-fired brass-melting furnaces as used by the Canadian Bronze, Ltd., of Canada in its plant located at Montreal will be of interest to brass foundrymen in general. Instead of using special shapes that require very accurate fitting, the company makes a one-piece lining, using crushed old firebrick bonded with Hytempite.

This type of lining is giving three to four times the life of the linings formerly used, and in addition to that the melting time has been reduced from an hour and a half to 40 minutes, due to the fact that the former linings, which were made of tile, were high in conductivity. Moreover, the hot metal frequently found its way into the joints and back of the linings, with the result that considerable metal was left in the furnace after each day's run. The use of a one-piece lining of crushed old firebrick bonded with this cement has doubled the capacity of the furnace, yet the only change which has been made is in the lining itself.

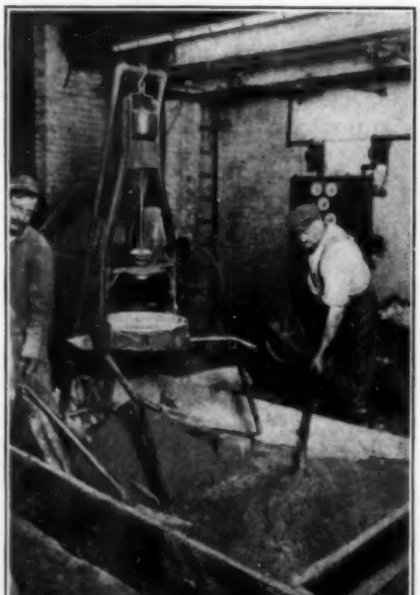


Fig. 2—Mixture when brought to molding sand consistency. The mixture is dry enough so that it is possible to pass it through a riddle.

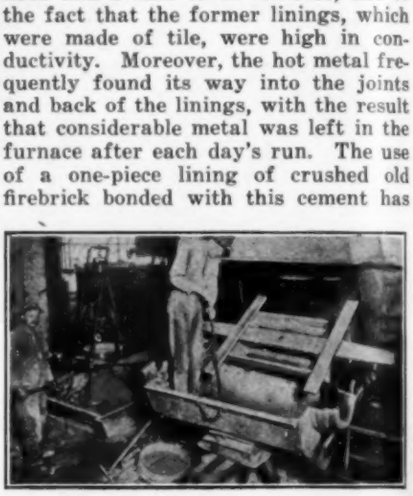


Fig. 3—Furnace shell. Tamping in that part of lining which will be under form when form is put in place.

Fig. 4—Bottom tamped in. Form now in place ready to pack side walls.

Fig. 5—Side walls packed and forms removed. Straw fire burning so as to dry linings for a wash coat of Hytempite batter.

The adjoining series of photographs shows the method of preparation and application of the one-piece lining.

In Fig. 1 water is being added to the cement, which has been placed in the mortar box to be diluted to the thickness of a pancake batter. The method of mixing the lining is as follows:

Old furnace linings, bats, etc., which

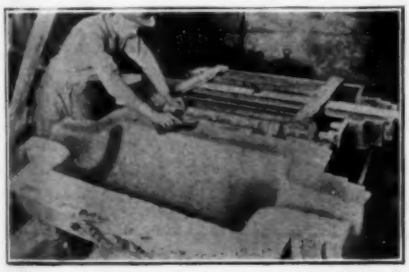
frequently find their way to the scrap heap, are crushed to pass ¼-in. mesh. This material, including the fines, is then added to the batter and thoroughly mixed, using a garden hoe and shovel. Enough crushed brick is added to make a mixture of the consistency of molding sand. This mixture should be dry enough so that it is possible to pass it through a riddle, as shown in Fig. 2. A wood form is made, the outline of which will conform to the inside surface of the lining. The mixed material is then tamped in along the bottom of the furnace shell to a sufficient depth to allow the form, when put in place, to rest upon it (Fig. 3).

The form is then put in place (Fig. 4) and the lining material filled in between form and shell and rammed in snugly, using alternately the ball and peen end of the rammer.

In Fig. 5 the form has been removed and a straw fire started so as to dry the lining before applying a wash coat of the batter. The wash coat is then applied as shown in Fig. 6, using a stiff brush.

Fig. 7 shows the complete lining for both sides of furnace. Before closing the sides, as shown in Fig. 8, a wash coat of the batter is applied all over the upper surface of both sides of the lining so that when the shell is closed the two halves will be sealed and the lining then becomes one piece without joints at any point. After the shell has been bolted, the furnace can be put in operation at once, without injury to the lining.

This furnace was lined under the supervision of a service engineer of the Quigley Furnace Specialties Co., Inc., 26 Cortlandt St., New York, manufacturer of Hytempite.



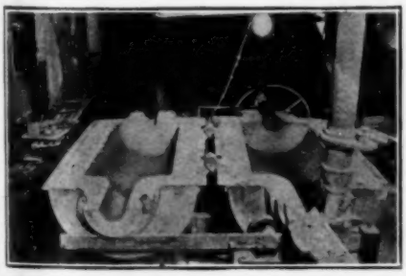


Fig. 6—Lining dry and wash coat applied. Note: No cracks or fractures. Impossible to get metal penetration. Walls smooth and dense.

Fig. 7—Lining tamped, washed and dried ready for cooling.

Fig. 8—Shell now being closed. The furnace, after shell has been bolted, can be put into operation at once without injury to lining. Note that when two halves of shell come together a wash of batter is applied just as shell is being closed, and batter forms a union when shell is closed. Lining then becomes one, without joint at any point.

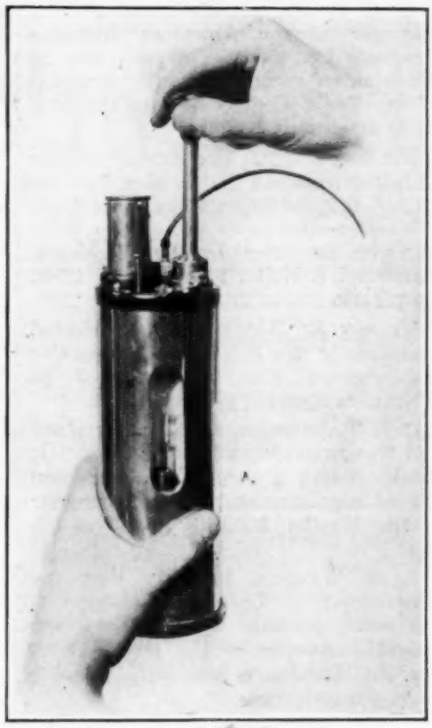


FIG. 1—THE "ECONOMETER"

Portable CO_2 Tester

An instrument has been designed for analyzing gases for CO_2 called the "Econometer." Of metal construction and neat design, it consists of a robust pump with a calibrated piston rod on which is engraved the CO_2 percentage scale, a rotary valve and absorbing chambers charged with a dry absorbent consisting of granulated soda lime. The instrument contains a drying tube, through which the gas sample is drawn, which contains granulated calcium chloride. No delicate working parts are put into the construction of this instrument, therefore no skilled adjustments are necessary.

The working of the "Econometer" is quite simple, requiring no special skill to operate; but it will give results to within a quarter of 1 per cent CO_2 contents. The instrument itself measures only 10½ in. long and 3½ in. diameter. No steam or water connections are necessary. The instrument is instantly applicable for accurate testing. No patent recharges are required, as the apparatus employs inexpensive and dry absorbents obtainable in the open market.

The process of analysis is controlled under conditions of constant temperature and pressure. The instrument is shielded from the effect of rise and fall in the temperature of the surrounding air by a cork liner which surrounds the whole apparatus and by a sealed water jacket containing all the working parts. It will be seen, therefore, that the interior portions are adequately protected from change in temperature due to external conditions during the period occupied by making a series of tests. The pressure of the gases in the apparatus during the test is maintained equal in every respect to that of the external atmosphere. The inventor made a study of this particular feature when designing the apparatus, as it prevents leakage of gas, when under analysis, past the valve.

The instrument in question has been patented and put on the English market by Kevlin, Bottomley & Baird, of Glasgow, Scotland.

Catalogs Received

UDYLITE PROCESS CO., Kokomo, Ind.—A booklet describing the Udylite rust-proofing process, a process of electroplating iron with cadmium to prevent corrosion.

INDUSTRIAL WORKS, Bay City, Mich.—A large and fine catalog containing a complete description of the various types of cranes manufactured by this concern. This catalog is issued on the occasion of the golden anniversary of the Industrial Works. In addition to complete descriptions and illustrations of cranes and a history of the development of cranes going back to the earliest days of engineering, this catalog contains much engineering information and many performance records of interest to engineers in general.

FIG. 2—INSTRUMENT IN CARRYING-CASE, SHOWING PORTABILITY

Personal

H. FOSTER BAIN, director of the United States Bureau of Mines, has resumed his duties in Washington after an absence of more than 2 months, during which he assisted the Department of Commerce in its inquiry into nitrate export conditions in Chile. The inquiry in which Director Bain assisted is one of a number of subjects undertaken by direction of Congress to determine the effect of foreign control on commodities for which the United States is largely dependent upon imports for its supply.

ALFRED A. COREY, JR., has been elected president of the Vanadium Corporation of America, New York, with plant at Bridgeville, Pa., succeeding J. LEONARD REPLOGLE, resigned. L. K. DIFFENDERFER, treasurer of the company, has also been elected secretary, to succeed E. F. NICKERSON, who resigned.

J. C. EVANS, chemical engineer, formerly with the National Bureau of Standards, is now in charge of the cement used in the Wilson Dam at Muscle Shoals, Ala. Mr. Evans has taken up his duties at Muscle Shoals and will have complete charge in testing all the concrete used on this work.

HERBERT GOODWIN has resigned as superintendent at the plant of the Crescent China Co., Alliance, Ohio, to become connected in an official capacity with the Atlas China Co., Niles, Ohio.

C. F. GRAFF, president and general manager of the American Nitrogen Products Co., Seattle, Wash., was in Washington recently for the hearings of the Tariff Commission on the duty on sodium nitrite.

NELSON LITTELL, assistant examiner of metal founding in Division 3 of the United States Patent Office since 1919, has resigned recently to accept a position with the patent law firm of Moses, Hammond & Nolte, 110 East 42nd St., New York.

NELSON K. MOODY has been elected president of the Prairie Oil & Gas Co., Independence, Kan., to succeed J. E. O'NEIL, resigned.

C. H. RASMUSSEN, formerly secretary and treasurer of the Perth Amboy Tile Works, Perth Amboy, N. J., has been elected secretary and general manager of the Mueller Machine Co., Trenton, N. J.

L. E. WEMPLE, formerly with the American Zinc, Lead & Smelting Co., has been appointed vice-president and general manager of the Illinois Zinc Co. Mr. Wemple succeeds E. H. WALKER as general manager.

E. R. WHITTEMORE is now employed by the General Electric Co. on a year's test work, preliminary to paper mill electrification work.

F. W. ZERBAN, at present research chemist with Pennick & Ford, Marrero, La., will succeed Charles A. Browne as chemist in charge of the New York Sugar Trade Laboratory, New York City.

Obituary

LANGDON GIBSON, who up to 2 years ago was production manager of the General Electric Co., Schenectady works, died on Sept. 5 at Criehaven, Me. He was 58 years of age. Mr. Gibson had been associated with the General Electric Co. for 31 years.

J. AMORY HASKELL, director and vice-president of E. I. du Pont de Nemours & Co., Wilmington, Del., died at his summer home at Red Bank, N. J., on Sept. 9, aged 62 years. He had been prominently identified with the explosives industry for about 30 years, becoming connected with the Hercules Powder Co. as vice-president in 1892. Later he was elected president of this company and the Repauno Chemical Co. In 1895 he became president of the Laflin & Rand Powder Co., which was acquired by the du Pont interests in 1902.

Dr. HARRY E. RICHARDS, of Bloomfield, N. J., president of the Martin Dennis Co., Newark, N. J., manufacturer of chemicals, died on Sept. 16 at his residence, after a long illness. He was born in Newark in 1853 and was educated at the Newark Academy and Princeton University.

DAVID M. STEINDLER, president of the Dominion Reduction Co., operating in Canada, died at his summer residence, St. John, N. B., on Aug. 27, of heart trouble, aged 60 years.

American Patents Issued September 11, 1923

The following numbers have been selected from the latest available issue of the *Official Gazette* of the United States Patent Office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem. & Met.'s* staff, and those which, in our judgment, are most worthy will be published in abstract. It is recognized that we cannot always anticipate our readers' interests and accordingly this advance list is published for the benefit of those who may not care to await our judgment and synopsis.

1,467,306—Method of and Apparatus for Drying and Conditioning Materials. W. H. Carrier, Essex Fells, N. J., assignor to Carrier Engineering Co.poration, Newark, N. J.

1,467,311—Method of Making Waterproof and Acidproof Receptacles. J. P. Elliott, Chicago, Ill.; N. B. Elliott, executrix of said J. P. Elliott, deceased.

1,467,342—Apparatus for Dissolving Solids. Edward A. Taylor, Cleveland, Ohio, assignor to Grasselli Chemical Co., Cleveland.

1,467,348—Apparatus for Separating Sand. G. R. Young, Huntington, N. Y., assignor, by mesne assignments, to Young Sand and Gravel Corporation, New York.

1,467,355—Apparatus for Washing and Wet Screening. N. C. Christensen, Salt Lake City, Utah.

1,467,356—Composition of Matter for Use as a Cement. H. A. Cook, Yakima, Wash.

1,467,377 — Foam-Producing Fire-Extinguishing Apparatus. J. R. Hamilton, Yonkers, N. Y., assignor to Ohio Automatic Sprinkler Co., Youngstown, Ohio.

1,467,397—Apparatus for Making Catalysts. W. P. Schuck, Portland, Ore., assignor, by mesne assignments, to Vegetable Oil Securities Co., Pittsburgh, Pa.

1,467,436 — Water Cooler. J. P. Kramer, Madera, Calif.

1,467,460—Gas Making. J. Vajk, Budapest, Hungary, assignor to C. A. Filkorn, McKeesport, Pa.

1,467,488—Sand-Blast Machine. Leonard Muste, Grand Rapids, Mich.

1,467,506 — Method of Cooling Coke. H. Schwenke, Herringen, Germany, assignor of one-half to Zeche de Wendel, Hamm, Westphalia.

1,467,509—Furnace Apparatus. L. B. Skinner, Denver, Colo.

1,467,546—Method of Melting Ferromanganese. R. D. Jordan, High Bridge, N. J., assignor to Taylor-Wharton Iron and Steel Co., High Bridge, N. J.

1,467,583—Apparatus for the Manufacture of Ether. F. E. Lichtenthaeler, Newton Highlands, Mass.

1,467,585—Joint for Concrete Pressure Pipes. J. C. Mitchell, East Orange, N. J., assignor to Lock Joint Pipe Co., Ampere, N. J.

1,467,590 — Aluminous Abrasive and Method of Making the Same. H. A. Richmond and R. Macdonald, Jr., Niagara Falls, N. Y., assignors to General Abrasive Co., Niagara Falls, N. Y.

1,467,598 — Manufacture of Phenyl Glycine Compounds. M. Wyler, Blackley, Manchester, England, assignor to British Dyestuffs Corporation, Ltd., Blackley, Manchester, England.

1,467,625—Process of Welding. H. W. Schoenfeld, G. A. Reinhardt, and E. T. McClear, Youngstown, Ohio.

1,467,669-70—Furnace for the Heat Treatment of Metals. L. C. Josephs Jr., Allentown, Pa., and G. Wirrer, Plainfield, N. J., assignor to International Motor Co., New York.

1,467,711—Process for the Manufacture of Intermediate Products and New Dyestuffs Derived From Diarylsulphones. Guillaume de Montmollin, Basel, Switzerland, assignor to Society of Chemical Industry in Basle, Basel, Switzerland.

1,467,733 — Manufacture of Metaldehyde. Emil Lüscher and Theodor Lichtenhahn, Basel, Switzerland, assignors to Elektrizitatswerk Lonza, Gampel and Basel, Switzerland. Original application.

1,467,757-58—Process and Apparatus for the Extraction of Hydrocarbon Oils From Shale. D. T. Day, Washington, D. C.

1,467,819 — Process of Preserving Wood. R. I. Smith, Washington, D. C.

1,467,827—Open-Hearth Furnace. C. C. Bumbaugh, Canton, Ohio, assignor of three-elevenths to A. Diekman, two-elevenths to H. A. Plantz, one-eleventh to H. L. Gray, one-eleventh to W. R. Davis, all of Canton, Ohio.

1,467,831—Process for Treating Petroleum Emulsions. W. S. Barnickel, St. Louis, Mo., assignor to Wm. S. Barnickel & Co., St. Louis, Mo.

1,467,849—Diffusing Apparatus. W. C. Graham, Denver, Colo.

1,467,855—Machine for Centrifugally Separating Solids From Liquids. G. Johnston, Manchester, England.

1,467,858—Process for Tanning Fish Skins. E. Knudsen, Trondhjem, Norway.

1,467,905—Hydrogenation Furnace. T. Midgley, Jr., Dayton, Ohio, assignor, by mesne assignments, to General Motors Research Corporation, Dayton, Ohio.

1,467,955—Gas Producer. D. J. Smith, London, England, assignor, by mesne assignments, to Automotive Gas Producer Corporation.

1,467,984—Employing Derivatives of the Condensation Products of Amines and Aldehydes in the Vulcanization of Rubber. C. O. North, Tallmadge, Ohio.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

Industry and Trade

Current News and Market Development

Summary of the Week

Tariff Commission investigation brings out estimate of low production cost for nitrite of soda in Norway.

New tariff law has increased litigation over customs duties at port of New York.

Germany will permit importations of 200,000 tons of Chilean nitrates, free of duty.

Production of paints and varnishes in first half of year larger than in corresponding period of 1922.

British foreign trade in chemicals and allied products shows gain for first half of year.

Alkali producers have announced contract prices for deliveries through 1924.

Officers of the Chemical Salesmen's Association elected at annual meeting.

Chemical engineers of Great Britain and America to exchange transactions at cost and to publish combined roster.

Technical meetings on ceramics and on pulp and paper at Chemical Exposition yield profitable material.

Anti-knock gasoline on market in Dayton, Ohio.

Du Pont company building new cellophane plant at Buffalo, N. Y.

Carnegie Institute of Technology offers new metallurgical courses.

Royal commission to open pulpwood hearings in Canada soon.

American Institute of Chemical Engineers announces names of committee on corrosion.

Low Production Costs for Nitrite of Soda in Norway

Estimate Made by Tariff Commission Indicates that Norwegian Producers Are Placing Nitrite in New York at Less than 3c. Per Lb.

A SUMMARY of information prepared by the Tariff Commission regarding sodium nitrite as a result of a public hearing held Sept. 10 on the application of the American Nitrogen Products Co. of Seattle, Wash., for an increase in the duty on this chemical discloses that no actual costs of production of nitrite were secured from foreign producers during the recent investigations in Europe.

At the hearing before the Tariff Commission no evidence or testimony was submitted by representatives of the Norwegian interests which entered opposition to the application for an increase in the duty. The costs of production of domestic plants were not made public at the hearing and are not disclosed in the summary of information, but have been laid before the Tariff Commission as confidential matter. It was stated in behalf of the applicant, however, that the present market price of sodium nitrite in the United States, which early in September was 7½c. per lb., does not permit a profit to the domestic producer.

In its summary, the Tariff Commission estimates the cost of production of nitrite by the Norsk-Hydro Co. of Norway, which is the principal competitor of the domestic firms, at 2.183c. per lb. at current exchange, or 3.275c. per lb. at par exchange. The cost of inland transportation, ocean transportation and insurance on shipments of sodium nitrite from Norway to the United States is stated to be only a small fraction above ¼c. per lb. If the estimate of cost of production in Norway be fairly accurate, then the Norwegian producers are now placing sodium nitrite in New York at a cost of less than 3c. per lb. at current exchange values, including production costs, packing, freight and insurance.

Estimate of Sodium Nitrite Costs in Norway

The cost of producing nitrite of soda in Norway, according to the estimate formed by the Tariff Commission, presents the following details:

	Kroner per Short Ton	Converted Cost per 100 Lb. Current Exchange	Converted Cost per 100 Lb. Par Exchange
Power—			
2-hp.-yr. at 20 Kr.	40.0	$0.333	$0.50
Soda ash—			
1 ton at 130 Kr....	130.0	1.083	1.625
Labor (estimated at 6% of total labor of plant).....	26.2	.218	.327
Sub-total.....	196.2	$1.634	$2.452
Total cost (estimated on basis that power, soda ash and labor are 75% of total cost).....	262.0	2.183	3.275

Imports of sodium nitrite from Norway in March, April and May, 1923, were 1,073,000 lb., the average invoice value being 4.84c. per lb., c.i.f., New York, the statement shows. Deducting packing, freight and insurance charges, the average price received at the factory in Norway was 4.34c. per lb. The spread between the landed cost and the selling price of at least 7½c. per lb. must include 3c. per lb. duty. The profit, according to these estimates, at current exchange would be the difference between 4.34c. per lb. and 2,183c. per lb., or more than 100 per cent.

The Norsk-Hydro Co., has an annual capacity for sodium nitrite of about 24,000,000 lb. It uses the arc process, which is the process used also by the American Nitrogen Products Co. The Norsk-Hydro plant also manufactures sodium nitrate, in connection with the production of calcium nitrate, the daily capacity being 441 short tons of calcium nitrate, 44 short tons of sodium nitrate and 33 short tons of sodium nitrite, the production of the latter thus being relatively small. In the United States calcium and sodium nitrate are not produced in connection with sodium nitrite.

The agents of the Tariff Commission also failed to get costs of production of the Badische Corporation of Germany for sodium nitrite. This company fixes nitrogen by the Haber ammonia process, making chiefly nitric acid and nitrates, sodium nitrite being obtained in the process of the minor product.

Final arguments in the application for a 50 per cent increase in the present 3c. per lb. duty have been fixed by the Tariff Commission for Sept. 26.

Fuel Economy and Refractories Features of Ceramic Day at Exposition

Data of Utmost Practical Value Presented in a Well-Arranged Program Before the Fall Meeting of the American Ceramic Society

WEDNESDAY, Sept. 19, was Ceramic Day at the Chemical Exposition. Following a technical program presided over by vice-president R. D. Landrum which kept the motion picture room filled all afternoon, more than eighty members of the American Ceramic Society attended the dinner at the Hotel Commodore.

Fuel Economy in Kiln Management

Discussions of methods for promoting fuel economy in kiln management formed an important part of the technical session. These included a report by Frederick W. Donahoe, secretary, Refractory Manufacturers Association, of results obtained in the co-operative investigations being conducted by the Refractory Manufacturers Association and the Bureau of Mines; and a paper by George A. Bole, superintendent, Columbus Ceramic Experiment Station, Bureau of Mines, on "Possible Economies and Methods of Obtaining Them."

Proper selection of fuel was the first point emphasized by Mr. Bole. Individual conditions influence the choice, but having determined the best fuel for the purpose at hand, it pays to go to some trouble in order to be sure that the same grade is obtained right along. Specifications as to B.t.u. and fusion point of ash will be of material assistance. All such effort will be in vain, however, unless the fuel is properly burned after it has been received. In the case of oil, the choice of the system is all important. There is a decided trend toward the use of high oil pressures and low steam pressure. Deposition of soot during the initial stages of a burn may be avoided by starting with a light oil, changing to a heavier one later on. Competent engineering advice is indispensable.

With coal, it is possible to effect more economy in combustion than in choice. While power plant work requires complete combustion in the firebox, this is frequently undesirable in ceramic kilns, as it is better to have progressive burning around the ware, combustion becoming complete in the crown of the kiln. Ability to control air admitted through the fuel bed and excess air over fire or at other points in kiln requires study of kiln conditions by means of Orsat apparatus and suitable dampers to enable proper adjustment. Mechanical stokers are worthy of more careful consideration, as is the question of mechanical draft, both forced and induced.

Proper heat distribution is one of the great economies, reducing the time of firing and insuring more uniform ware. While it is largely a matter of kiln design, methods of setting and firing are also factors. Conservation of heat through the use of insulation may best be studied through heat balances. It is unfortunate that we know so little regarding the flow of heat through materials at high temperatures. It should not be necessary to call attention to the economy of setting only properly dried ware.

Waste heat from cooling kilns is widely used for drying green ware, but the recovery of heat from kilns under fire by means of waste heat boilers is still a new field. The use of regenerative systems in the ceramic industry is confined almost entirely to glass furnaces and tanks. The increasing use of continuous kilns, both railroad tunnel and compartment, is a step toward fuel economy. Temperature recording systems and draft gages should be a part of regular kiln equipment. Through consideration of the factors outlined it has been found possible to reduce burning time 25 per cent and fuel consumption 20 per cent in many installations.

Properties of Refractories

R. M. Howe, of the Kier Fire Brick Co., considered in some detail the properties of commercial refractories. In connection with the decrease in fusion point under load, it was pointed out that in many parts of furnaces, such as the side walls and roofs, the outer portion of the brick is cool enough to withstand the pressure of the setting without deformation.

As regards spalling, firebrick show wide variations which may be attributed in part to the use of raw materials with different tendencies toward vitrification. Changing the proportions of clay and burned clay or grog will often reduce spalling.

Thermal conductivity is not the only factor in heat transfer through refractory walls; gases also pass through under pressure or suction. In a furnace operating at 1,300 deg., temperature measurements were made in the furnace wall ½ in. from the inside surface. With a pressure of 1 in. water inside the furnace, a temperature of 1,305 deg. was noted; with a pressure of 0.05 in. water, 1,265 deg.; with a draft or suction of 0.3 in. water, 1,105 deg.

How Refractories Are Made

W. F. Rochow, Harbison-Walker Refractories Co., outlined the methods of making fireclay, silica, magnesite and chrome refractories.

Flint clay and plastic clay, raw and calcined, enter into the manufacture of firebrick. The clay is carefully selected, proportioned, ground in wet pans, formed in hand presses, partly dried or tempered on hot floors, repressed, dried, and burned in down-draft kilns.

For silica brick, quartzite or ganister containing 97 to 99 per cent SiO_2 is crushed to 2 in. ring size, fed to wet pans with about 2 per cent lime and the resulting mud formed into shapes by pounding into steel molds. After drying, the brick are burned, care being required to insure development of best characteristics.

Magnesite high in iron from Austria or Washington magnesite to which iron has been added is dead burned, ground, machine pressed without additions of any kind and burned at cone 18 to 20.

Similar procedure is followed in making chrome brick from Grecian ore containing 38 to 50 per cent Cr_2O_3.

Industrial Art

Three papers were presented under the general heading of industrial art. Richard F. Bach, curator industrial arts, Metropolitan Museum, discussed the industrial art movement and its possibilities in the ceramic industries; A. E. O. Munsell described and illustrated his ingenious method of color measurement; H. S. Busby spoke on color analysis and its industrial significance.

Organization and activities of the Federal Specifications Board were outlined by R. F. Geller, of the Bureau of Standards, while similar insight into the workings of the American Construction Council was given by Dwight L. Hoopengarten.

New Cellophane Plant for du Pont

Construction has begun on the River Road, Buffalo, of the new plant of the du Pont Cellophane Co., a subsidiary of E. I. du Pont de Nemours & Co., for the manufacture of cellophane. This is a transparent, cellulose product hitherto imported only from France. This new plant is claimed to be the first one in this country to establish the domestic manufacture of the article. It adjoins the plant of the du Pont Fibresilk Co. It is expected that the new plant will be in operation by June, 1924. Until that time the company will continue to import the material to meet the American demand.

The officers of the du Pont Cellophane Co. are: L. A. Yerkes, president; B. M. May, vice-president and treasurer; M. du Pont Lee, secretary, and J. S. Denham, sales manager. Directors are: W. C. Spruance, chairman; Albert Blum, Henry L. Blum, Lamont du Pont, Charles Gillet, Edmond Gillet, B. M. May, B. G. Paskus, F. M. Pickard, Dr. Fin Sparre and L. A. Yerkes.

The use of cellophane is extending in the millinery trade because of its decorative qualities and is also being largely used in the grocery, meat products, toilet and drug manufacturing lines for containers. It is produced in sheets or rolls. It is non-gelatinous and will not melt or decay. It is said to be harmless, water and grease proof, odorless and can be dyed in any shade, or printed upon with ease.

Washington News

Wholesale Prices Lower in August

Wholesale prices in August registered a slight drop from the July level, according to the monthly report issued by the Bureau of Labor Statistics. The bureau's index number, based on prices of 404 commodities, dropped to 150 in August, a decline of 1 point from the figure for the previous month.

Small declines took place among chemicals and drugs and among commodities classified as miscellaneous, including such important articles as leather, wood pulp, manila hemp, jute and lubricating oil.

Production of Paints Increased in First Half of Year

The Department of Commerce announces that, according to census returns, there was produced during the 6-months period Jan. 1 to June 30, 1923, 247,154,400 lb. of paste paints, comprising white lead in oil, 149,636,700 lb., zinc oxide in oil, 12,115,110 lb., and other paste paints, 85,402,600 lb., 43,719,200 gal. of ready-mixed and semi-paste paints, and 37,882,200 gal. of varnishes, japans and lacquers; an increase of 18.5 per cent in paste paints over the production for the same period of 1922, 34 per cent in the production of ready-mixed and semi-paste paints, and 41.2 per cent in the production of varnishes, japans and lacquers.

The returns are based upon reports from 441 establishments, of which 136 reported the manufacture of white lead in oil, 148 the manufacture of zinc oxide in oil, 287 the manufacture of other paste paints, 368 the manufacture of ready-mixed paints and 283 the manufacture of varnishes, japans and lacquers.

The schedule employed included an inquiry in regard to sales, not contained in the schedule used for the semi-annual censuses of 1922. Information in regard to sales was not, for various reasons, furnished by all establishments; but the production of the establishments reporting sales constitutes 85.8 per cent of the total production of paste paints, 73.5 per cent of the ready-mixed and semi-paste paints, and 80.2 per cent of the varnishes.

Chilean Nitrate Granted Free Entry Into Germany

The Federal Food Controller of Germany has informed the Federal Agricultural Association that after exhaustive discussions with the several interests involved the government has agreed to permit the importation of 200,000 tons of Chilean nitrate duty free during the period ending June 30, 1924, according to a report from American Consul E. Verne Richardson at Berlin.

It is explained that this importation will be effected through the Association of Nitrate Importers, which must offer 50 per cent of the total quantity to German farmers through the Purchasing Association of German Farmers and 50 per cent to the German fertilizer trade. Should either of these not need the whole of its share, the surplus may be offered to the other.

Worrell Mfg. Co. Files Answer To F.T.C. Complaint

The Worrell Mfg. Co. of St. Louis, engaged in the manufacture and selling of insecticides, disinfectants and sanitary appliances, has answered the complaint of the Federal Trade Commission charging unfair practices in competition with other firms. The Worrell firm was cited for giving free goods as premiums under its "profit sharing plan."

The goods given away by the defendant were no higher than the average price of commodities sold by other concerns, and in many instances were cheaper and more effective, it was averred. The Worrell company also said the selling price was the same as before the commission filed its complaint. With regard to the other charges the company categorically denied them.

Points Way to Improve Lime Manufacture

Experiments conducted at the Bureau of Standards have shown a way to improve the manufacture of hydrated lime so that the grade known as "finishing" hydrate is regularly produced instead of the grade known as masons' hydrate, which because of its lesser plasticity commands a lower price. These tests have shown that plasticity depends not alone upon the colloidal content of the hydrate but upon the effect on this colloid of the manufacturing process. The colloid, like glue, must not be allowed to dry out during the manufacturing process, and it must also be prevented from flocculating itself when the mixing water is added preparatory to use.

It has been found that the drying out can be prevented by letting the freshly made hydrate cool in an atmosphere of steam, while flocculating can be prevented by adding small amounts of a readily soluble calcium salt. A hydrator designed to apply these principles has just been completed for further experiment.

Reappraisement Regulation Is Amended

An amendment to the customs regulation providing for appeals for reappraisement to be taken by collectors was issued last Monday by Assistant Secretary of the Treasury Moss.

According to the amendment an appeal for reappraisement may be taken by the collector within 10 days from the date of the filing with him of the decision of the general appraiser, and he shall immediately furnish the consignee or his agent with a copy of the application for review. There shall be indorsed on the application for review, which is mailed to the board, the date of the mailing of the copy of such application to the consignee or his agent, and the one who does the actual mailing shall sign his name to such indorsement.

Investigations Into Foreign Monopolies Nearly Completed

Reports of the Commerce Department's investigations into foreign monopolies of the production of essential raw materials will be ready for Congress when it meets in December, according to an announcement made last week by Secretary Hoover. The surveys into foreign control of the production of rubber, sisal, nitrate and other raw materials, he said, were progressing rapidly and the department's findings would be available early in the coming session.

PAINT AND VARNISH PRODUCTION

	1923: First Half Jan.-June		1922				Per Cent of Increase or Decrease		
	No. of Establishments	Production	No. of Establishments	Production	No. of Establishments	Production	2d Half 1922–1st Half 1923	1st Half–2d Half 1922	1st Half 1922–1923
Total number	*441	.....	426	.....	402	.....	.....	....	.....
Paints—									
Paste paints, lb.	...	247,154,400	...	227,703,400	...	208,592,100	8.5	9.2	18.5
White lead in oil, lb.	136	149,636,700	141	153,212,500	104	139,376,400	–2.3	9.9	7.4
Zinc oxide in oil, lb.	148	12,115,100	125	5,457,700	120	4,486,700	122.	21.6	170.
Other paste paints, lb†	287	85,402,600	268	69,033,200	228	64,729,000	23.7	6.6	31.9
Ready-mixed and semi-paste, including wall paints, "mill whites," and enamels, gal.	368	43,719,200	354	33,440,000	337	32,631,300	30.7	2.5	34.
Varnishes, japans and lacquers, gal.	283	37,882,200	262	28,877,000	246	26,832,400	31.2	7.6	41.2

* Not including 11 establishments for which reports have not yet been received. These establishments reported for the second half of 1922, 1.3 per cent of the total paste paints, 4.6 per cent of the total ready-mixed and semi-paste paints, and 1.5 per cent of the total varnishes, japans and lacquers.

† Includes some white lead in oil and zinc oxide in oil, the production of establishments not separately reporting paste paints.

British Foreign Trade in Chemicals Gains in First Half of Year

Value of Imports and Exports Higher Than in 1922—Exports Greatly Exceed Imports

EXPORTS from the United Kingdom of chemicals, drugs, dyes and colors in the first 6 months of 1923 were practically double in value imports of these commodities in that period, according to a report from the American consulate-general at London. Both imports and exports in that period were of a higher aggregate value than in the corresponding 6 months of 1922, imports advancing by £1,509,000 to an aggregate of £6,863,136 and exports increasing by £2,704,950 to £13,120,508.

On the import side, in the chemical section, crude and distilled glycerin and potassium nitrate alone decreased in quantity compared with the first 6 months of 1922, while chief among articles showing advances were acetic acid, tartaric acid, borax, red and orange lead, calcium carbide, sodium nitrite and "other" sodium compounds, and cream of tartar. The average import price per unit, based on the 6 months aggregate imports, was higher this year for acetic acid, tartaric acid, bleaching materials, borax and zinc oxide, and a decrease in price was shown by calcium carbide, crude and distilled glycerin, potassium and sodium compounds, and cream of tartar.

In the drugs, medicines and medicinal preparation section there were larger imports in volume accompanied by lower average import prices. Quinine and quinine salts increased to 519,417 oz., compared with 311,533 oz. in 1922, and bark (cinchona, Peruvian, etc.) increased to 5,614 cwt., compared with 1,125 cwt.

Dye and Dyestuffs Statistics

In the dyes and dyestuffs section, intermediate coal-tar products rose to 111,700 lb. in the first 6 months of 1923, compared with only 100 lb. in the corresponding period a year ago, but alazarin recorded a decrease to 568,400 lb., contrasted with 674,200 lb. Intermediates declined in everage import price from £22 per cwt. to £10 3s. 8d. per cwt., while alazarin increased to £5 from slightly over £4 per cwt. Of synthetic indigo, 806,300 lb. was received in the first half of 1923, compared with none in the same period of 1922 and with 706,300 lb. in the 1921 period, but whereas the aggregate imports in the 1923 period were valued at £11,579, the smaller imports in 1921 value than in the corresponding six of finished coal-tar dyestuffs totaled 2,066,700 lb., against 1,689,500 lb. in 1922, but the value declined to £501,364 contrasted with £652,604 for the small quantity.

Imports of natural indigo fell in the period to 48,000 lb., against 76 800 lb. a year ago, the average price being higher. Extracts for tanning also increased in volume.

Imports of barytes recorded a considerable rise in quantity with a slight advance in average import price, whereas white lead supplies were somewhat smaller at practically a stationary price.

On the export side, shipments of sulphuric acid, ammonium muriate, potassium compounds (other than chromate and bichromate and nitrate) and caustic soda were smaller in quantity than a year ago for the 6 months period. The largest gains in export were in tartaric acid, ammonium sulphate, benzol and toluol, anthracene, naphtha, napthalene, creosote, and crude and distilled glycerin.

In the matter of average export prices in the first half of 1923 compared with the same period of 1922, there were decreases in tartaric acid, ammonium muriate, bleaching powder, anthracene, benzol and toluol, naphtha and naphthalene, sulphate of copper, disinfectants, crude and distilled glycerin, chromate, bichromate and nitrate of potash, and carbonate, caustic and chromate and bichromate of soda, and there were higher rates for sulphuric acid, ammonium sulphate, carbolic acid, creosote, unenumerated potassium compounds, sodium sulphate, unenumerated soda compounds, and zinc oxide.

In drugs, medicines and medicinal preparations, there was a somewhat higher export of opium (dried and powdered in the United Kingdom) at an enhanced average export price, and reduced exports of quinine and quinine salts at a lower price.

Exports of dyes and dyestuffs aggregated 7,477,300 lb., against 4,723,600 lb., products of coal-tar totaling 4,198,800 lb., compared with 2,342,900 lb., while the average export price was lower in the 1923 period. Exports of "other sorts" of dyes and dyestuffs totaled 3,282,500 lb., against 2,380,700 lb., also at a lower price.

Exports of colors and materials increased in the aggregate to 77,959,300 lb., contrasted with 58,934,500 lb. in the 1922 period, with the average export price being lower. Varnish exports totaled 672,354 gal., compared with 531,321 gal., with a price slightly lower on the average in the 1923 period.

Carnegie Tech Offers New Courses in Metallurgy

One of the most important developments of the past year at Carnegie Institute of Technology, according to an announcement from the institution, has been the recent organization of an advisory board of Pittsburgh business and scientific men to co-operate with the work of the department of mining and metallurgy. The formation of the board and the enlisting of the co-operation of its members constitute another step in line with the policy of the institute to link up its educational facilities with outside industry.

C. W. Heppenstall, president of the Heppenstall Forge & Knife Co., has been elected chairman of the board, which includes the presidents, managers and executives of twenty-two large industrial firms in the Pittsburgh district. It was organized at the invitation of Dr. Thomas S. Baker, president of Carnegie Tech, who with the heads of the mining and metallurgy department convinced the board members that such a development would posses unusual potential advantages.

The immediate function of the advisory board, according to the announcement, will be co-operate with the Institute of Technology in the solution of current problems affecting the work of the mining and metallurgy department. A similar board has already been organized during the past 2 years in co-operation with the co-operative department of mining.

Beginning with the next college year, the institute announces also, special courses for graduates of liberal arts and technical colleges will be given by the department of mining and metallurgy. This decision has been made, it is said, in response to a definite and increasing demand of the metallurgical and allied industries for college men.

Pacific Coast Scientists Hold Joint Meeting

The Pacific Division of the American Association for the Advancement of Science held its annual meeting at the University of Southern California on Sept. 17, 18 and 19. On Sept. 19 the California Section and the Southern California Section of the A.C.S. held a joint session, at which the following papers were presented: "New Studies in Nitrogen Fixation," Prof. C. B. Lipman; "Present Status of Chemical Criteria in Soil Fertility Investigations," Prof. John Burd; "The Determination of Calcium," Dr. William Conger Morgan; "Critical Solution Temperatures," Dr. G. Ross Robertson; "A Study of Pressure and Temperature Effects on Petroleum Emulsions," Dr. Laird J. Stabler; "Butyrin," Dr. Leroy S. Weatherby; "The Vapor Pressure of Monatomic Elements," Russell H. Miller; "A System of Qualitative Analysis Including the Rare Elements," Dr. A. A. Noyes and Dr. W. C. Bray; "Dissociation of Hydrogen Cyanide at High Temperatures," R. M. Badger; "The Rate of Dissociation of Sulphuryl Chloride," D. F. Smith; "Studies on the Chemical Behavior and the Physical Properties of Insulin," G. A. Alles and A. L. Raymond; "New Experiments on the Oxidation Reduction Theory of Contact Catalysis," A. F. Benton and P. H. Emmett.

Anti-Knock Gasoline Now a Commodity of Commerce

Tetra-ethyl Lead Supplied to Dayton Motorists at a Cost Less Than Benzol-Gasoline Mixtures

Anti-knock motor fuel is now a commercial accomplishment, according to a statement made before the Petroleum Division of the American Chemical Society by Thomas Midgley of the General Motors Research Corporation. At the Milwaukee meeting he declared that gasoline to which tetra-ethyl lead has been added is now being marketed in the vicinity of Dayton Ohio, and is sold under the name of "ethyl gas."

So that the company supplying it will not have to furnish and lease pumps, the makers have devised an apparatus known as an "Ethylizer" which fits any gasoline pump and adds the anti-knock compound in the proper proportion. However, it may be added by the refinery or at the bulk station, or even in the tank wagon. Mr. Midgley claims there will be no separation or deterioration due to exposure to light.

Three c.c. of tetra-ethyl lead and 2 c.c. of carbon tetrachloride to a gallon of gasoline give the best results at present. It has been found that the use of tetra-ethyl lead alone caused sparkplugs to deteriorate rapidly due to the presence of lead and the oxidizing condition prevalent in the combustion chamber. Adding the carbon tetrachloride gives something for the lead to hook on to, and causes the formation of lead chloride, which readily passes out through the exhaust. The only disadvantage noted from its use thus far is the deposit of some white lead chloride in the combustion chamber and exhaust valves. This sometimes leads the motorist to think that something is wrong because he has only seen black carbon deposits before. Midgley has found absolutely no harm to the motor from its use.

Cost Seems Reasonable

According to Midgley, ethyl gas is no better for a motor than benzo-gas, provided good benzol practically free from sulphur compounds is used, and that is apparently hard to get. In the vicinity of Dayton benzo-gas is sold for 6 cents per gal. more than gasoline, and ethyl gas costs but 3 cents more, which makes it attractive from a cost standpoint.

With our present motors ethyl-gas is attractive to the motorist, because it eliminates knocking on hills and pulls, without retarding the sparks. It probably also makes more efficient operation, because the average motorist will retard his spark to prevent knocking and then drive several miles before he remembers to advance it. Thus there might be a slight increase in mileage, but in general it only means more pleasant driving. Knocking of a motor, if it is not continued for some time, does not harm the motor, but it is mighty unpleasant for the driver and other occupants of the automobile.

If the use of anti-knock compounds becomes general enough so that higher compression motors can be built, it would mean almost double the mileage from a gallon of gasoline. The General Motors Corporation has built such a motor and has been able to get 31.5 miles per gallon, where with the present type 16 miles is a good return.

News Notes

The Garden City Paper Mills of St. Catherines, Ont., propose building another paper mill to cost about $400,000. The product of the company will include light papers, tissue papers, towels and wax paper. An allied company is the Canadian Vegetable Parchment Co. with a mill at Merritton, Ont.

Production was started recently at the plant of the Chile Explosive Co., at Calama, Chile. Interested in this company are du Pont and Atlas Powder companies and Nobels, Ltd. Woodsen Boyle is general manager and J. W. Old is plant superintendent, with Howard Lentz as assistant superintendent.

As a result of a test made recently of the gas taken from the low-pressure, shallow well of the Prairie Natural Gas Co., Ltd., near Craigmyle, Alta., to determine the quality of the gas for the purpose of manufacturing carbon black, a plant is to be erected at a cost of about $15,000 and a new well will be drilled for more gas. The possibilities of carbon black have been discussed rather extensively in this province during the last year by geologists.

The Millville Bottle Works, Inc., Millville, N. J., is arranging for the early resumption of operations at its plant, and furnaces are being lighted. The shearers, who have been out with a demand for an increased wage scale for a number of weeks, have agreed to return to work at the previous wage level.

The British Empire Steel Corporation, it is understood, plans to put into operation the battery of coke ovens erected 2 years ago by the Koppers Corporation. There are 120 ovens in operation at the plant at Sydney at present, but according to present plans eighty more will be put into operation. With this extra production the corporation hopes to be able to supply the upper Canadian market with coke for domestic use.

The Utah Copper Co., Salt Lake City, Utah, is advancing production at its plant at Bingham, and is now treating close to 30,000 tons of ore per day. It is proposed to increase this output gradually until a maximum of about 40,000 tons is being handled daily. On the present basis of operation it is estimated that the 1923 production at the plant will exceed 175,000,000 lb.; costs are declining and copper is now being produced at close to 8c. per lb.

Manufacture of creosote wood preserver has been undertaken by the Alberta Wood Preserving Co., Calgary, and the manufacture of this product is now being carried on in the former plant of the Calgary brick works. This is the only institution of its kind in Alberta, Saskatchewan or British Columbia. Creosote is being supplied from the Imperial Oil Refinery.

In the matter of lignite coal and lignite coal dust, which are now admitted into Canada duty free, a ruling of the Customs and Excise Department just issued provides that such coals are to be defined as having not less than 6 per cent moisture content on the air-dried basis. Lignite coals, it is declared, include all grades lower than true bituminous.

"Reactivity of Coke in Relation to Blast-Furnace Operation," was the subject of a joint paper by George St. J. Perrott, assistant physical chemist, and Ralph S. Sherman, assistant physicist, U. S. Bureau of Mines, Pittsburgh, presented at the bi-monthly meeting Steel Works Section, Engineers' Society of Western Pennsylvania at the William Penn Hotel, Pittsburgh, Tuesday evening, Sept. 18.

Further Co-operation Among Chemical Engineers

From now on, the American Institute of Chemical Engineers and the Institution of Chemical Engineers in the United Kingdom are to co-operate in the exchange of all transactions at cost. It was announced at the meeting of the American Institute on Sept. 19 at New York that during the current year the cost of supplying members with the transactions of the British Institution would be absorbed by the Institute. As a mark of mutual courtesy the roster of the combined societies is to be printed under a single cover henceforth. It is expected that this friendly linking up with brother engineers across the sea will be productive of constantly increased good feeling between the two organizations, whose aims and purposes are fundamentally the same.

Oil Industry Booming in Texas

In connection with a state-wide survey of industries in Texas, the Texas Chamber of Commerce, Dallas, has recently compiled figures showing the extent of the petroleum industry in the state. It is set forth that there are now 756 active oil companies paying a production tax, of which the six leading companies defray a total of 37.4 per cent, these being the Gulf Refining Co., the Texas Co., Magnolia Petroleum Co., Sinclair Refining Co., Humble Oil & Refining Co., and the Humphreys Oil Co. The state has an aggregate of 121 oil refineries, with total rated capacity of 450,000 bbl. per day; there are approximately 56,000 persons engaged in the industry throughout the state. The value of refined petroleum products in Texas amounts to about $250,000,000 per annum.

New Tariff Law Has Doubled Litigation Over Duties at Port of New York

Part of Increase Due to Larger Amount and Variety of Imports—Attorney-General Would Remedy Unjust Rates by Utilizing Flexible Provision

IMPORTERS of chemicals and allied products were interested in a report submitted last Wednesday to Attorney-General Daugherty. The report was compiled by Assistant Attorney-General Hoppin and showed that there was an increase of more than 100 per cent in litigation over customs duties at the port of New York since the new tariff went into effect.

A large percentage of the increase, Mr. Daugherty declared, may be attributed to the general revival of business and the consequent increased amount and variety of imports under the new act. The new act, he explained, by its enlargement of the jurisdiction of the Board of General Appraisers, has added to the litigation passing through the New York office.

Discussing the new tariff law from the standpoint of the legal department of the government, he maintained that the flexible provisions of the act should be utilized to remedy any unjust rate schedules now in operation.

He stated that importers of foreign merchandise represent important interests in this country and are entitled to fair treatment and as expeditious a determination of the tariff act, under which they are doing business, as is practicable. On the other hand, the tariff law is primarily for the protection of the country's domestic interests, and, that being the case, its provisions must be effectively lived up to if those interests are to be protected. For if the law is unjust in its application the flexible provisions of the act should be brought into play to remedy it. A fair deal to both sides has been the aim of this branch of the Department of Justice.

Naturally, increased business has brought increased litigation. This is clearly shown by a comparison of the work recently transacted by the office of the Assistant Attorney-General in charge of customs with the report for the previous year. This shows a percentage of increase in cases filed with the Board of General Appraisers of more than 100 per cent. High tariff duties increase litigation because a recovery of those duties means more to the importer than the recovery of low duties.

The increase in litigation, however, is also due in a large measure to an increase in the jurisdiction of the Board of General Appraisers and the Court of Customs Appeals. Many cases now heard by these courts were formerly under the exclusive jurisdiction of the Secretary of the Treasury. This enlargement of powers of the customs tribunals has, of course, added very greatly to the work of the customs division of the Department of Justice.

Calendar

AMERICAN ELECTROCHEMICAL SOCIETY, forty-fourth meeting, Dayton, Ohio, Sept. 27 to 29.

AMERICAN GAS ASSOCIATION, annual convention, Atlantic City, Oct. 15 to 20.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, winter meeting, Washington, D. C., Dec. 5 to 8.

AMERICAN MANAGEMENT ASSOCIATION, Hotel Astor, New York, Oct. 29-31.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, annual meeting, New York City, Dec. 3 to 6.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS, annual convention, New York City, Dec. 3 to 5.

AMERICAN SOCIETY FOR STEEL TREATING AND INTERNATIONAL STEEL EXPOSITION, Motor Square Garden, Pittsburgh, Pa., Oct. 8 to 13.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS, convention and exposition, Buffalo, N. Y., Sept. 24 to 28.

NATIONAL ASSOCIATION OF PRACTICAL REFRIGERATION ENGINEERS, fourteenth annual convention, Memphis, Tenn., Dec. 12 to 16.

NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING, Grand Central Palace, New York, Dec. 3 to 8.

NATIONAL SAFETY COUNCIL, twelfth annual safety convention, Statler Hotel, Buffalo, Oct. 1 to 5.

SOCIETY OF AUTOMOTIVE ENGINEERS, annual meeting, simultaneously with the Detroit Automobile Show, General Motors Bldg., Detroit, Mich., Jan. 22 to 25, 1924.

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY, Appleton, Wis., Oct. 25 to 27.

Mathieson Announces New Alkali Prices

For several years the Mathieson Alkali Works, Inc., had taken advantage of Chemical Show week to hold a sales convention at that time and to have in New York for this conference all salesmen, district sales managers, plant executives and research men.

The company went farther this year, and included in its convention plans representatives of the fifty distributors who are now acting as local agents for the Mathieson company.

At the convention the company's plans and policies were announced, and the most important of these from the standpoint of the chemical trade, was the announcement of contract prices on alkali for delivery over all of 1924.

The following prices, effective Sept. 20, 1923, and subject to change without notice, will apply on contracts for 1924:

	Per 100 Lb.
58 Per Cent Light Soda Ash	
In bulk	$1.33
In 200-lb. bags	1.45
In 300-lb. barrels	1.69
58 Per Cent Dense Soda Ash	
In bulk	1.42
In 300-lb. bags	1.51
In 400-lb. barrels	1.75
76 Per Cent Solid Caustic Soda	
In 700-lb. drums	3.165
76 Per Cent Ground Caustic Soda	
In 425-lb. drums	3.60
In 425-lb. barrels	3.85
76 Per Cent Flaked Caustic Soda	
In 400-lb. drums	3.60
In 400-lb. barrels	3.85
U.S.P. Bicarbonate of Soda—Powdered	
In 112-lb. kegs	2.25
In 330-lb. barrels	2.00
In 400-lb. barrels	2.00
In 200-lb. paper-lined bags	1.90
In 200-lb. plain burlap bags	1.875
In bulk	1.75

Prices on granular U.S.P. bicarbonate of soda are 37½c. per 100 lb. higher.

Royal Commission to Open Pulpwood Hearings Soon

While the royal commission appointed to investigate the pulpwood resources of Canada has held a number of sessions in Ottawa for organization purposes and preliminary study of the situation from material which has been prepared for it by the forestry branch of the Department of Interior, no public hearings have been held yet and no opportunity has been extended to any persons or group of persons to plead either for or against the proposed embargo. It has been decided to commence the public hearings in the Maritime Provinces, and the first will be held in Halifax on Oct. 2. Hearings will then be held in various centers in each of the other Maritime Provinces, and then in Quebec, Ontario and every province until the Pacific coast is reached.

Various organizations throughout Canada are being circularized to give them an opportunity to prepare their cases for submission at the public hearings. In the meantime the organization work of the commission is going on and it is understood the program will include visits to pulp and paper mills in various parts of the dominion.

Financial Notes

The Barnet Leather Co. has declared regular quarterly dividend of 1¾ per cent on the preferred stock.

The New York Stock Exchange has received notice from the International Agricultural Corporation of proposed change in capital stock from $18,000,000 7 per cent preferred $100 par stock, and $18,000,000 common $100 par stock, to $10,000,000 prior preference cumulative 7 per cent preferred stock and 450,000 shares of common stock of no par value.

The American Window Glass Machine Co. has declared an extra dividend of 1 per cent on the common stock. Regular dividends also were declared of 1¼ per cent on common stock and 1¾ per cent on preferred.

The Merrimac Mills, Inc., has declared regular quarterly dividend of 1¾ per cent on preferred and $1.25 per share on common stock.

The Asbestos Corporation of Canada has declared quarterly dividends of 1 per cent on the common stock and 1¼ per cent on the preferred stock.

Paper and Pulp Men Hear Practical Talks

Exposition Program Carried Out With Several Technical Discussions of Value to Industry

The meeting of the Technical Association of the Pulp and Paper Industry, held in connection with the Chemical Exposition, although poorly attended, yielded several papers of considerable interest. The papers covered a wide range of subjects; the program as originally planned was carried through with the exception of the address by T. L. Crossley, who was unable to be present.

The standardization of paper was discussed by Hubb Bell of the United States Testing Co. He pointed out that there are at least 176 different kinds of paper and a tremendous number of superfluous terms in use. Standard sizes and specifications do not exist, but might well reduce expense of manufacture through simplification. The A.S.T.M. has standardized other materials, and no reason exists preventing such standardization from being introduced in this case. The difficulty of accurate sampling, the vast number of furnishes and the necessity of control of raw materials were pointed as being important factors in this respect. The government has reduced expense and increased quality of the paper used by its bureaus through standardization. Methods of test should be as scientific as value of product will permit.

Using Electrical Precipitation

How the Cottrell electrical precipitator may be applied to the paper industry was pointed out by N. W. Sultzer of the Research Corporation. In plants manufacturing soda pulp, black liquor is first evaporated and then calcined. Recoverable dust escaping may carry 3 to 5 per cent of the original carbonate. Net return possible on investment was stated to run from 35 to 40 per cent. The same considerations hold for the sulphate process. A possible cleaning of the sulphur dioxide in gas for making sulphite liquor was also pointed out. Sulphuric acid mist might thus be removed.

Cleaning of flue gases for drying purposes was included as a desirable application in the pulp and paper industries.

Liquid chlorine's applicability to the manufacture of bleach liquor by the Mathieson system was discussed by J. H. MacMahon. He pointed out the general manner of bringing together chlorine and an alkaline paste and emphasized the fact that the temperature rise is proportional to the amount of chlorine added. The absorption of heat by the chlorine may be made to offset the heat rise due to the reaction, by means of placing the vaporizing coils in the tank in which the mixing is brought about. Losses of available chlorine through overheating are thus eliminated.

Silicate of soda gives hardness and smooth finish to a paper, besides increasing strength somewhat. Silicate of soda is used in connection with portland cement in digester linings.

For beater work the less the soda content in general the less alum required for precipitation. For concrete floors, a highly acidic silicate treatment in hot solution is frequently useful.

Adhesiveness of silicate of soda depends mainly on quick drying. While not waterproof, it is useful for binding, laminating and labeling. Being greaseproof, papers thus treated are especially useful for covering cartons, etc. Highly acid silicates are most useful for these purposes.

Silica formed in the presence of a large amount of water is finely divided. Silicate makes clay more fluid and hence is very useful in book paper manufacture.

A paper by Raymond F. Baker was read indicating that selenium impurities in sulphur cause spots in paper using such a raw material. Sulphur thus contaminated is not produced in the United States. Approximately 300,000 tons of sulphur is used per year in the paper and pulp industries. A composition of 65 per cent and 35 per cent ground coke has been suggested for non-corrodible tanks handling solutions at temperatures below boiling.

Chemical Salesmen Hold Banquet and Election

The third annual banquet of the Salesmen's Association of the American Chemical Industry was held at the Hotel Commodore, New York, on Sept. 20. Dr. Charles H. Herty acted as toastmaster, introducing Major Henry T. Allen, who spoke on conditions in the Ruhr, and Edgar Fahs Smith, who discussed the development of the chemical industry in this country, pointing out that a great many important discoveries have been made here rather than abroad, as is commonly supposed.

At the election of officers, the following were chosen for the coming year:

President, Ralph E. Dorland; first vice-president, E. A. McKinnon; second vice-president, George Bode; third vice-president, David Stewart; secretary, A. J. Binder; treasurer, George Ashworth; executive committee for 2-year term, George Dunning, D. H. Killefer; for 1 year to fill unexpired term of Ralph E. Dorland, Frank L. Hensler.

Corrosion Committee Appointed

The committee of eleven members appointed by the American Institute of Chemical Engineers to investigate the problems of corrosion has just been announced. It is composed of four producers: W. H. Bassett, American Brass Co.; J. P. Hubbell, New Jersey Zinc Co.; P. D. Merica, International Nickel Co.; D. W. Thompson, National Lead Co.; and of seven non-producers: W. S. Calcott, E. I. du Pont de Nemours & Co.; W. M. Corse, National Research Council; J. V. N. Dorr, Dorr Co.; R. T. Haslam, M.I.T.; E. C. Lathrop, S. S. Sadtler Co.; A. E. Marshall, consulting chemist, and W. D. Richardson, Swift Co.

Equipment Men Favor a Sellers' Exposition

Committee to Be Appointed to Formulate Plans—Officers Elected

The annual meeting of the Chemical Equipment Association was held at the Chemists' Club, New York, Sept. 20, President Schenck in the chair.

The work of the association in the 10 months since it began active operations, with a central executive office and a secretary, was reviewed by President Schenck. Recommendations for the broadening of this work along lines of general service, advertising to equipment-using fields and interchange of information among members were made.

The association by unanimous vote of the members present instructed the new president to appoint a committee to formulate plans for an exposition of chemical equipment.

It was very plainly the sense of the association that, however valuable the presentation to the general public or to selected sections of it the development of chemical manufactures may be, the interests of producers of equipment and supplies for the chemical industries and conditions inherent in those industries point to the advisability of a selling exposition also.

Officers and directors for the ensuing year were elected as follows: President: T. C. Oliver, Chemical Construction Co.; vice-presidents, E. E. Finch, Karl Kiefer Machine Co.; J. George Lehman, Bethlehem Foundry & Machine Co.; Peirce D. Schenck, Duriron Co.; treasurer, P. S. Barnes, Pfaudler Co.; directors, Harlowe Hardinge, Hardinge Co.; P. B. Sadtler, Swensen Evaporator Co.; H. N. Spicer, Dorr Co.; R. Gordon Walker, Oliver Continuous Filter Co.; G. O. Carter, Union Carbide Co.

For the sixth place on the board of directors Robert McKay, International Nickel Co., and L. S. Thurston, General Electric Co., received an equal number of votes. One of these two will be elected by the other directors.

Golf Tournament of Chemical Salesmen's Association

Thirty-seven players took part in the golf tournament of the Salesmen's Association of the Chemical Industry, held at the Ardsley Club, Ardsley-on-Hudson, Tuesday, Sept. 18. A. H. Pierce, with a score of 88, won the silver pitcher for the low gross. D. R. Melville finished in the lead in the low net with a score of 70, his handicap being 20. Second low gross went to C. H. Stone, and second low net to John Black. Third low gross was awarded to A. M. Taylor; third low net to A. J. Higgins.

For handicaps of 20 or more the first low net prize went to W. F. Tuttle, the second to H. T. Edgar, third to R. E. Dorland and fourth to R. J. Quinn. J. A. Kilcommons arrived first in the kickers handicap. Birdies, one each, were made by the following: J. A. Kienle, P. M. Dinkins and J. Wrench.

Market Conditions

Better Inquiry for Heavy Chemicals Covering Distant Deliveries

Producers Ready to Accept Alkali Contracts for 1924—Jobbing Lots Feature Spot Trading—Export Demand Increasing

THE market was featured during the week by the announcement of a leading producing company that it had extended current contract prices on soda ash, caustic soda, and bicarbonate of soda, to include deliveries over all of next year. Previously producers were reluctant to accept orders for distant positions and some consumers feared that high prices for fuel and other strong costs of production might force higher levels for 1924 contracts.

Reports on activity in the market varied. In some quarters it was stated that actual buying orders for prompt delivery showed a falling off as compared with the preceding week. Other reports stated that the Chemical Exposition brought buyers into the market and resulted in a large volume of business. It is generally conceded that consuming trades are more active and interest in forward deliveries was noted for many commodities.

The weighted index number again moved upward. This reflects a firmer position of the general list of chemicals and allied products but does not mean that the market is entirely free from selling pressure. A few items are still weak with a downward price tendency due to the slow consuming demand and keen competition among sellers.

An improved call has been noted for export and in many cases round lot orders have been placed for outward shipment. As domestic industries are opening up on a wider scale the prospects in general are regarded as promising.

The recent hearing on nitrite of soda before the Tariff Commission has aroused considerable comment as to the possibility of tariff changes, not only on that chemical, but also on others which have been under investigation. The nitrite hearing brought out interesting comparisons of production costs here and in foreign countries.

Arsenic is one of the materials which has attracted interest especially for forward positions. Shipment prices for domestic and foreign are very firm and even the spot market has been firmer. The position of foreign producers seems to be doubtful and until this has been cleared up, there will be uncertainty about the real strength of the market.

Another development of the week was noted in the recovery of bleaching powder. Either distressed lots have been absorbed or sellers have ceased to cut prices to the extent recently reported and the market closed with a fair show of strength.

Acids

Acetic Acid—Details on exports for July show that foreign buyers have been interested only in small lots. Of the total exports for the month, amounting to 31,857 lb., 13,590 lb. went to Brazil, 4,977 lb. went to Mexico, 3,225 lb. to Venezuela, 2,324 lb. to Cuba, 1,924 lb. to the Philippines, and the balance in lots of less than 1,000 lb. were shipped to sixteen different countries. There was no change in the local market during the week. Consumption is reported to be satisfactory and prices are holding a steady position. Quotations are: \$3.38@\$3.63 per 100 lb. for 28 per cent; \$6.78@\$7.13 per 100 lb. for 56 per cent; \$9.58@\$9.83 per 100 lb. for 80 per cent; \$12@\$12.78 per 100 lb. for glacial.

Contract Prices Announced on Soda Ash and Caustic Soda — Contracts Also Offered on Bicarbonate of Soda — Arsenic Firmer—Tin Oxide Up 2c. per Lb.—Bichromates Under Pressure—Nitrite of Soda Firmer—Formaldehyde Easy.

Boric Acid—With sellers competing keenly for business, the market remains in an easy position and quotations are holding at the level established in the recent decline. Asking prices are 9½@10c. per lb., in sacks, 10@10½c. per lb., in bbl., and 10½@11c. per lb., in kegs.

Citric Acid—Demand has been spotted with some reports that small lots were moving freely while others stated that very little call for stocks was apparent. There was no interest in shipments and spot goods were quoted at unchanged levels of 49@50c. per lb. This quotation applied both to domestic and imported makes.

Formic Acid — Offerings of foreign made acid are on the market and moderate sized lots are passing to consumers. Demand is quiet and does not extend to future positions. Domestic acid is purely nominal. The quotation of holders is 12@14c. per lb. for imported grades.

Lactic Acid—While not active there is a gradual improvement in the call for supplies and sellers say that fall requirements of consumers are beginning to exert an influence on the market. The improved trading movement is a steadying factor on prices which are quoted at: 4½@5c. per lb. for 22 per cent dark and 5½@6c. per lb. for 22 per cent light; 9½@10c. per lb. for 44 per cent dark and 11½@12c. per lb. for 44 per cent light.

Oxalic Acid—Considerable interest is shown by consumers and the readiness of sellers to compete for business is giving buyers an advantage. Prices are irregular as reports of shading are common. The open quotations are around 12c. per lb. for foreign and domestic grades.

Sulphuric Acid—Official figures show that exports of sulphuric acid in July were 797,102 lb. valued at \$14,939. The greater part of this went to Mexico and Cuba. The position of domestic markets remains easy and buyers are able to trade at private terms to advantage. Asking prices are kept at \$9@\$11 per ton, in tanks, for 60 deg. and \$15@\$16 per ton, for 66 deg.

Potashes

Bichromate of Potash—Some sellers, and this has included first hands, have been competing strongly for business and prices have weakened under pressure. Buyers have had no difficulty in securing stocks at 9½c. per lb. and the latter figure seems to be well established as the trading basis. However, in some quarters 9¾c. per lb. is quoted as the inside price.

Bicarbonate of Potash—As spot supplies have diminished, the market has gained in strength. Some sellers are not quoting owing to lack of stocks and there are no large lots offered in any direction. Prices are irregular and private terms are figuring in current sales.

Caustic Potash—Imported grades are still in plentiful supply on spot and demand has not been active enough to bring about any change in values. Some holders are asking 7¼c. per lb. but it was stated that considerable quantities could be purchased at 7c. per lb. Domestic caustic is holding an unchanged position and is not influenced by the lower prices quoted for imported. Producers quote 9c. per lb. at works and upwards on a quantity basis.

Chlorate of Potash—Domestic chlorate has suffered because of the greater consumption of imported grades. This condition is still apparent with good interest in foreign. The latter is meeting with a good demand both on spot and for shipment. Prices are quoted as steady at 7½c. per lb. on spot with shipment up to 7¾c. per lb.

Prussiate of Potash—Red prussiate is very quiet with prices irregular and quoted at 60c. to 63c. per lb. Yellow prussiate also is inactive and is reported to be weak at 30c. per lb. on spot. Shipments are offered at 28c. per lb. and while this represents a lower price level than prevailed for the greater part of the year, it fails to stimulate buying.

Sodas

Soda Ash—One of the leading producers has issued a schedule of contract prices to cover deliveries over all of next year. The schedule became effective Sept. 20, and quotes 58 per cent light ash at $1.33 per 100 lb. in bulk; $1.45 per 100 lb. in bags; and $1.69 per 100 lb. in bbl. Quotations for 58 per cent dense soda ash are $1.42 per 100 lb. in bulk; $1.51 per 100 lb. in bags; and $1.75 per 100 lb. in bbl. These prices are unchanged from those in effect in recent months, but they are important inasmuch as they indicate the willingness of sellers to book orders for distant deliveries.

Bicarbonate of Soda—Producers have announced that they are prepared to accept orders for 1924 deliveries and have named prices as follows: U.S.P. bicarbonate of soda, powdered, in kegs, $2.25 per 100 lb.; in bbl. $2 per 100 lb.; in paper-lined bags $1.90 per 100 lb.; in plain burlap bags $1.875 per 100 lb.; in bulk $1.75 per 100 lb. There is a steady withdrawal against existing orders and consumers also are reported to be interested in new commitments covering distant positions.

Bichromate of Soda—A very easy tone has permeated the market. Producers have been forcing matters and most sellers have been willing to meet whatever competition arose. Considerable business has been put through and it is generally held that prices are low and are easy only because of the desire to move stocks. Spot and prompt is openly offered at 7¾c. per lb. with reports that 7½c. per lb. has been done. It is also stated that 7½c. per lb. can be done on forward positions.

Caustic Soda—The most important development of the week was the establishment of contract prices for 1924 deliveries. New contract prices effective Sept. 20 and holding good on deliveries over all of next year are: 76 per cent solid caustic soda $3.165 per 100 lb. in drums; 76 per cent ground caustic soda $3.60 per 100 lb. in drums and $3.65 per 100 lb. in bbl.; 76 per cent flaked caustic soda $3.60 per 100 lb. in drums and $3.85 per 100 lb. in bbl. These prices represent a continuance of former contract prices over the coming year. Export demand for caustic has been stimulated by the fact that sellers were willing to quote at lower levels. Standard makes were held at $3.10@$3.15 per 100 lb. f.a.s. and outside brands could be bought at close to $3 per 100 lb.

"Chem. & Met." Weighted Index of Chemical Prices

Base = for 1913-14

This week	174.23
Last week	173.22
Sept., 1922	148.00
Sept., 1921	147.00
Sept., 1920	267.00
Sept., 1919	272.00
Sept., 1918	278.00

Formaldehyde closed lower, but the uplift in crude cottonseed oil caused the index number to advance 101 points in the past week.

Nitrate of Soda—The fertilizer trade is not prominent in the market at present although their requirements have been only partially covered ahead. This is said to be due to a belief that prices will not advance and also to the fact that collections are still being made from Southern consumers, on last season's material. No material changes are reported in primary markets. Domestic markets are easy because of slow buying but consumers are expected soon to begin operations. Spot nitrate is easy at $2.45 per 100 lb.

Nitrite of Soda—Imports of nitrite have fallen off in volume in the past 2 months but considerable quantities are said to be held here. The market, however, is growing firmer and 7¾c. per lb. was quoted this week for prime goods. A little better call is reported for domestic makes with 7½c. per lb. quoted. Considerable speculation has arisen regarding the possibility of a change in duty as a result of tariff investigations.

Prussiate of Soda—Foreign prussiate was less firm during the period. The quotation of 14c. per lb. for spot material could be shaded and 13¾c. per lb. was reported to be a trading level. Domestic prussiate was maintained at 14c. per lb. but was quiet.

Miscellaneous Chemicals

Arsenic—The market has continued to strengthen and spot material was said to be unavailable under 11½c. per lb. Demand for spot material is not active but there are inquiries in the market and holders are unwilling to shade quotations. Some domestic producers are offering contracts involving large amounts at 11c. per lb. covering delivery through March. Bids for moderate sized lots for Dec.-Jan. shipment were refused at the 11c. per lb. level. The latter referred to foreign material. Imported grades are not offered freely and the reluctance of sellers is one of the features of the present market.

Formaldehyde—Official returns place exports of formaldehyde in July at 94,320 lb., of which 67,000 lb. were for Japan. At present there is very little call for stocks either for home consumption or for export. Prices are falling and first hands are openly offering at 12½c. per lb. Resale material is on the market at 12c. per lb. and this adds to the general weakness of the market.

Copper Sulphate—There have been rumors that foreign sulphate has been offered on spot at close to 4c. per lb. but buyers say they have been unable to secure supplies around that figure and 4¾c. per lb. is given as the current market price. Shipments from abroad still figure out around 4½c. per lb. Domestic sulphate has been reduced to 5c. per lb. for large crystals.

Acetate of Lime—Export trade in this material in July is shown to have been confined to 3 countries. Exports were 2,608,952 lb. to Japan, 291,485 lb. to Netherlands, and 45,614 lb. to Belgium. Domestic consumers are reported to be taking normal quantities and prices are holding steady at $4 per 100 lb.

Tin Oxide—Strength in the metal market has placed the oxide in a firmer position and makers announce an advance of 2c. per lb., making the quotation 47c. per lb. Bichloride of tin and tin crystals are unchanged in price.

Salt Cake—There is a large movement against old orders and makers are said to hold orders for shipments for some time ahead. There are sellers, however, for prompt shipment from works and $25@$26 per ton is asked for bulk shipments.

Saltpeter — Heavy shipments from abroad have reached the market during the week and foreign material is offered at different prices. Domestic makes are holding steady in price with quotations at 7½@9c. per lb. for crystals, 6½@6¾c. per lb. for granulated, and 7½@7¾c. per lb. for powdered.

Alcohol

A steady undertone featured the market for denatured alcohol, but no additional changes were reported. The recent advance of 2c. per gal. stimulated buying interest. On formula No. 1, 188 proof, leading producers quote 41c. per gal., in drums, carload lots. Formula No. 1, 190 proof, special, in drums, held at 40c. per gal. Ethyl spirits, 190 proof, U.S.P., closed at $4.75@$4.80 per gal., cooperage basis. Methanol was unaltered in price, but competition for business tends to unsettle the market. On the 95 per cent grade producers quote 95c. per gal., in drums, carload lots, and $1 per gal., less than carload lots. The 95 per cent grade, in cooperage, was offered at $1.05 per gal. On the 97 per cent grade first hands ask a premium of 2c. per gal. Pure methanol, in tank cars, was offered at $1 per gal.

Coal-Tar Products

Benzene Unsettled—Cresylic Acid Irregular—Better Call for Intermediates—Inquiry for Colors Improves

SHADING of prices for benzene by smaller operators created the impression that the market was lower in all directions. Several large handlers admitted that the market was lower in certain quarters, but pointed out that the reduction was by no means general. One operator, who held much surplus stock a short time ago, disposed of the bulk of his holdings to producers of motor fuel on private terms. By disposing of material of low grade in this way the market for the 90 per cent benzene has not come under heavy selling pressure. Production has been maintained because of the coke situation and consumers continue to regard the immediate future as favoring buyers. Foreign inquiry was in evidence, but in most instances English producers have been in a position to book most of the business. Irregular prices obtained for cresylic acid, phenol and naphthalene, prompt and forward delivery. In other directions the outlook appears more promising. Intermediate makers have inquired more freely for crudes and this was regarded as a favorable development. Reports from textile centers have been encouraging and the demand for colors has picked up since the first of the month. Advices from abroad indicate that the market for coal-tar products is a very unsettled affair.

Manchester, England, reports price cutting in solvent naphtha, benzene and crude naphthalene.

Aniline Oil—Producers continued to offer aniline oil for prompt shipment from works at 16c. per lb., carload lot basis. It was reported that less than carload business could have been placed in some quarters at this figure. Demand was routine only, with consumers not inclined to purchase far ahead.

Aniline Salt—Quotations heard range from 23@24c. per lb. The market was inactive, but fairly steady so far as first hands were concerned.

Benzaldehyde—Offerings of the f.f.c. grade have been larger and producers are sellers on the basis of $1.60 per lb., in drums. On the U.S.P. grade the market held at $1.50. Technical was available at 75c. per lb., in drums, prompt shipment from works.

Benzene—Prices named on 90 per cent benzene ranged all the way from 22@25c. per gal., tank car basis, f.o.b. works. Several large factors on this commodity refused to quote less than 25c. per gal., but admitted that sales did go through at less. Because of the fact that so much of the output is not refined, the real pressure exists in the motor grades. Some export business was put through last week, but the volume was not large. According to official statistics the production of motor benzene in 1922 amounted to 57,025,699 gal., while the output of refined was placed at 10,419,504 gal.

Creosote—The market here underwent no change. Manchester, England, quoted creosote oil for shipment at 8¼@8¾d. per gal., bulk basis, f.o.b. works.

Cresylic Acid—Trading was quiet all week, but prices asked varied considerably. One operator asked from 95c.@$1 per gal. for a pale grade manufactured from foreign material. Other traders had good quality acid for sale at 80@75c. per gal., immediate shipment from works. On contract it was possible to do 70@75c. per gal., as to grade, seller and quantity.

Dimethylaniline—Steady prices were reported by producers. Quotations held at 41@43c. per lb.

Naphthalene—An easy undertone prevails in naphthalene, but producers did not come out with an open reduction in prices. Chips are available at 5@5¼c. per lb., shipment from works, carload basis. Flake naphthalene was nominal at 6¾@7¼c. per lb., immediate shipment. Crude was offered for shipment from abroad on the basis of 2¼@2½c. per lb., c.i.f. New York, good quality merchandise. Manchester quotes crude at £7@£13 per ton, bulk basis, works, with a possibility of shading the inside figure on low grade stock.

Paranitraniline—The demand was a little better, but prices did not change much, holding at 72@75c. per lb., depending upon delivery and seller.

Phenol—U.S.P. material on spot held nominally at 28@30c. per lb. Demand was restricted and confined chiefly to small lots for nearby delivery. On futures prices were wholly nominal, producers making special effort to interest consumers in long time contracts. On contract business it was possible to shade 25c. per lb.

Pyridine—Scattered lots were offered for nearby delivery at $5 per gal. The offerings were scanty. Foreign material for shipment was offered at $4.50 per gal. Domestic production is sold up.

Solvent Naphtha—Producers report a firm market for solvent naphtha, but prices asked on contract deliveries underwent no change. The water white for shipment held at 27c. per gal., tank cars, f.o.b. works.

Alabama to Mine Bauxite

Bauxite has been found in large quantities in the neighborhood of Baker Hill, 15 miles south of Eufaula, Ala.

Some mining is being done now and will be started on a large scale within a few weeks.

L. E. Wemple Joins Illinois Zinc Co.

L. E. Wemple, who was for many years with the American Zinc, Lead & Smelting Co. and who was later connected with the Evans Lead Co., and recently resigned, has been appointed vice-president and general manager of the Illinois Zinc Co., with a plant at Peru, Ill., and offices in New York, Chicago, Pittsburgh and Philadelphia. The company has been engaged in the manufacture of rolled zinc products for the last 50 years, but is now planning a new program of chemical manufacturing. Mr. Wemple will be at the plant for some time but has not yet decided where he will establish his headquarters.

Annual Safety Congress to Be Held in Buffalo

The Twelfth Annual Safety Congress of the National Safety Council will be held in Buffalo from Oct. 1 to 5. Included in the Congress will be joint meetings with the American Association of Industrial Physicians and Surgeons and the annual safety conference of the New York State Department of Labor.

There will be several general sessions, and in addition, sessions on safety as especially applied to the various industries. For instance, on Wednesday morning, Oct. 3, the Chemical Section will meet and papers will be presented for discussion on safety measures and codes in the chemical industry.

An exhibit dealing with safety education will be shown in the Y.M.C.A. Building. This will contain entirely novel and striking features in addition to more concrete, specific material, showing how the school work in safety is being carried on.

Palmolive Co. Will Build Plant in New Jersey

Charles S. Pearce, vice-president of the Palmolive Co. announced last week that a new plant will be erected by the company in New Jersey. He stated that a careful survey of last year's business shows that 50 per cent of the Palmolive shipments could have been made more economically from New York than from Milwaukee, and the company has therefore purchased a factory site in New Jersey as a step toward greater efficiency in supplying foreign markets as well as the Eastern seaboard, the South and the Pacific Coast.

Mr. Pearce denied the rumor that the Palmolive headquarters were to be moved to the East in the immediate future, although he said it was possible that the development of a manufacturing plant in the East might mean moving the executive offices at some future date. There are no definite plans at present, however. At any rate, there will be no such move until the completion of the New Jersey plant, construction of which has not yet begun.

Vegetable Oils and Fats

Cottonseed Higher on Strong Statistics—Linseed Active—Coconut Easier—Tallow Declines—Menhaden Up

STOCKS of cottonseed oil are the smallest in years and this is responsible for the sharp advance in prices. Crude and refined oils sold at new highs for the movement. Unfavorable crop developments exerted a strong influence on the forward options. Linseed oil steadied and sales of November forward went through on the basis of 81c. per gal., cooperage basis. Coconut oil eased off on resale offerings on the Pacific coast. Palm oils quieted down on the decline in tallow. Menhaden oil sold at an advance of 2½c. per gal.

Cottonseed Oil—An analysis of the August statistics on cottonseed products, the first month of the new crop year, revealed that the visible supply on the last day of the month was 272,000 bbl., against 365,000 bbl. a month ago and 433,000 bbl. a year ago. The stocks are the smallest in years and caused longs in nearby oil to sit tight. Distribution of refined oil in August amounted to 202,594 bbl., against 163,000 bbl. a month ago and 168,000 bbl. a year ago. The statistics were regarded as extremely bullish, yet prices advanced in an orderly manner. It was reported that a large refiner absorbed about 4,000 bbl. of spot oil. Cash trade was good, but some resale offerings appeared on the market and refiners were cautious about sending prices too high. Bleachable oil sold at 11¼@11½c. per lb., buyers' tanks, f.o.b. Texas points. Supplies of bleachable virtually have been cleaned up and the market was a nominal affair. Crude sold at 10½c. per lb., September shipment from Southern points an advance of ¼c. Early October shipment crude sold at 10c., Texas, while early November was offered in a small way at 9½c. per lb., tank car basis. Crop news was unfavorable and private estimates now range from 10,200,000 to 10,800,000 bales. Lard compound was advanced to 13½@14c. per lb., as to seller.

Linseed Oil—Seed prices were firm under good buying by crushers and this steadied the market for oil. There was no great change in the general situation, but Buffalo crushers appeared anxious to get hold of new crop seed for shipment East. Crushers have found it advantageous to buy domestic seed as the price asked for nearby Argentine is a little out of line. The fact that Argentine seed has been holding steady tends to confirm reports of moderate stocks in the South American market. A feature during the week was the better call for oil for forward delivery, paint makers, as well as linoleum manufacturers, taking on round lots. One crusher took most of the business, booking orders at 81c. per gal., cooperage basis, for November forward contracts. Other trades refused to quote less than 83c. per gal. on the forward position. Spot oil held at 90c. asked, carload basis, cooperage included, with September at 88c. Early October was offered at 86c., with late October at 83c. per gal. November settled nominally at 81@83c. November-April also closed at 81@83c., the price depending upon the seller. Stocks of seed at Minneapolis were placed at 152,493 bu., against 44,644 bu. the week previous and 16,173 bu. a year ago.

China Wood Oil—Cables from China were higher and this steadied the market. A round lot, comprising more than 6,000 casks, arrived here last week from Hankow. Bids for prompt shipment oil in tanks at 19½c., New York, were turned down. The asking price on tank cars closed at 20@20½c. Oil in cooperage, spot, was raised to 22@22½c. per lb.

Cottonseed and Cottonseed Products Statistics, August, 1922-1923

	1922	1923
Seed received, ton	100,470	159,218
Seed crushed, ton	52,245	52,453
Crude oil m'f'd, lb	14,303,208	14,464,442
Ref'd oil m'f'd, lb	10,642,725	11,797,524
Cake and meal, ton	24,395	24,860
Stocks Aug. 31:		
Seed, ton	61,393	119,551
Crude oil, lb	10,038,321	7,430,655
Refined oil, lb	106,843,010	68,756,947
Exports:		
Crude oil, lb	90,231	402,388
Refined oil, lb	1,679,265	1,306,927
Cake and meal, ton	15,786	6,794

Coconut Oil—The sale of 5 tanks of Ceylon type oil went through late in the week at 8c. per lb., f.o.b. Pacific coast, a decline of ¼c. The transaction involved resale oil. Most holders continued to quote 8½c., coast. In the local trade the asking price was 8⅝c. per lb. Copra was easier, Cebu sundried selling at 4¾c., coast.

Corn Oil—Crude corn oil sold at 10c. per lb., September shipment.

Palm Oils—Demand was less active and prices eased just a little. Lagos for shipment settled at 7.55c. per lb. Softs closed at 7.40@7.45c. Niger was offered at 7.24c. per lb., c.i.f. basis.

Soya Bean Oil—It was reported that refiners were interested in obtaining nearby material. The market held nominally at 9½c. per lb., sellers' tanks, duty paid, New York. No sales were reported.

Fish Oils—Crude menhaden oil was raised 2½c. per gal. on sales of 2,500 bbl. The business was placed at 45c. per gal., tanks, f.o.b. Baltimore. Fishing was fair and the fish were averaging high in oil content. Newfoundland cod oil was advanced to 64@66c.

Tallow, Etc.—In the last week or so more than 1,000,000 in pf. extra tallow sold at 8c. per lb., a decline of ¼c. At the London auction, held September 19, prices were 3d. to 1s. 3d. per hundredweight lower. Yellow grease closed at 7½c. nominal. Oleo stearine sold up to 13c. per lb., but offerings were reported at this figure later with no takers.

Miscellaneous Materials

Antimony—Steady prices were the rule, although not much business went through. Chinese and Japanese brands held at 7½@7⅝c. per lb. Cookson's was nominally unchanged at 10¼@10½c. per lb.

Blanc Fixe—A small shipment arrived from abroad. Domestic makes held at 4@4½c. per lb., in bbl., carload lots, immediate shipment. Demand has been inactive, but the tone fairly steady.

Casein—Technical grades were available on spot at prices ranging from 13½@15½c. per lb., as to quantity and seller. The inside price obtained on the imported material. Several parcels arrived at New York during the past week.

Glycerine—There was a higher market for dynamite glycerine, sales passing in the West at 16½c. per lb., an advance of ½c. The situation in the chemically pure grade underwent little change, although the tone was firmer. C.P. settled at 17@17½c. per lb., in drums, the inside figure obtaining on carload lots. In the West certain producers stood ready to trade at 16¾c., according to reports. Crude offerings were limited and the market held at 11@11½c. per lb., loose, soaplye, basis 80 per cent. Saponification, loose, was nominal at 12½@12¾c. per lb.

Naval Stores—Turpentine was higher early in the week, but eased off slightly before the close. Nominal quotations for spirits ranged from 98@99c. per gal., as to quantity. Demand for rosins improved, paper makers and soapers taking hold in a larger way. Prices steadied, closing about 10c. per bbl. higher. On the lower grades traders quoted $5.85@$5.90 per bbl. Some export inquiry also was in evidence.

Shellac—Foreign markets were about unchanged and this caused prices to hold here. Business was described as fair. T.N. on spot settled at 62c. per lb., with nearby material available at 61c. Bleached, bonedry, was nominally unchanged at 72c. per lb. Superfine orange on spot closed at 64@65c. per lb.

White Lead—The recent advance in pig lead to 6.85c. per lb. steadied the market for lead pigments but resulted in no revision in prices. Corroders reported a satisfactory volume of business for this season of the year. Standard dry white lead, in casks, held at 9½c. per lb., carload basis. Dry red lead, in casks, was quotably unchanged at 10½c. per lb. Litharge was offered at 10⅝c. per lb., in casks, carload basis.

Zinc Oxide—The rubber trade has been less active and this is reflected in the market for zinc oxide. While trading has diminished in volume the steady position of the market for raw materials tends to support prices. American process, lead free oxide, was unchanged at 8@8½c. per lb. On the leaded grades the market stood at 7@7½c. per lb. French process, red seal, sold on the basis of 9¾c. per lb.

Imports at the Port of New York

September 14 to September 20

ACIDS—Citric—1,000 csk., Palermo, Order. **Cresylic**—1 csk., Liverpool, A. Hurst & Co.; 60 dr., Glasgow, Caldwell & Co.; 2 dr., Glasgow, Order. **Phenol**—3 dr., Rotterdam, Lunham & Moore. **Stearic**—20 cs., Rotterdam, M. W. Parsons & Plymouth Organic Laboratories.

AMMONIUM NITRATE—319 csk., Hamburg, Kuttroff, Pickhardt & Co.

AMMONIUM CARBONATE — 20 csk., Liverpool, Farmers Loan & Trust Co.; 10 csk., Liverpool, J. Turner & Co.; 10 csk., Liverpool, Brown Bros. & Co.

ANTIMONY REGULUS—100 cs., Shanghai, Wah Chang Trading Co.; 500 cs., Shanghai, Nassau Smelting & Refining Co.

ANTIMONY OXIDE—200 bg., Shanghai, Rare Metal Product Co.

ALBUMEN—56 cs., Shanghai, Gallagher & Asher; 86 cs., Shanghai, D. L. Moss & Co.; 78 cs., Shanghai, A. Stein & Co.; 50 cs., Shanghai, Innis, Speiden & Co.; 40 cs., Shanghai, T. M. Duche & Sons.

ARSENIC—346 cs., Kobe, G. F. Taylor & Co.; 117 bbl., Tampico, American Smelting & Refining Co.; 91 bbl., Tampico, American Metal Co.

BARIUM CARBONATE—67 csk., Hamburg, Order.

BARYTES—400 bg., Bremen, New York Trust Co.

BLANC FIXE — 30 csk., Hamburg, P. Uhlich & Co.

BRONZE POWDER—11 cs., Hamburg, L. Uhlfelder Co.; 12 cs., Hamburg, Stone Gross Shipping Co.

CASEIN—1,667 bg., Buenos Aires, Kalbfleisch Corp.; 467 bg., Hamburg, Bank of the Manhattan Co.; 198 bg., Hamburg, Art. Horn Prod. Corp.; 20 sk., Hamburg, Order.

CAMPHOR—200 cs., Shanghai, American Express Co.; 100 cs., Hamburg, A. Ochse & Co.

CHALK—500 tons, London, Order; 1,500 bg. and 300 bbl., Antwerp, Bankers Trust Co.; 500 bg., Antwerp, L. A. Salomon & Bros.

CHEMICALS—130 csk., Rotterdam, Stanley, Doggett, Inc.; 30 cs., Rotterdam, Order; 75 dr., Hamburg, A. Kramer & Co.; 25 bbl. Hamburg, A. Hurst & Co.; 2 cs., Bremen, Merck & Co.; 123 csk., Hamburg, Stanley Doggett; 93 bbl., Hamburg, Roessler & Hasslacher Chemical Co.; 15 bbl., Hamburg, Hummel & Robinson; 137 pkg., Hamburg, Jungmann & Co.; 750 bg., Glasgow, E. M. Sergeant & Co.; 56 csk., Glasgow, Fraser & Co.; 35 bbl., Hamburg, Adolph Hurst & Co.

CITRATE MAGNESIA—250 cs., Genoa, East River Nat'l. Bank.

COAL-TAR PREPARATIONS — 6 pkg., Hamburg, Franklin Import & Export Co.

COLORS—22 csk. dry, Southampton, Order; 5 csk. dry, Rotterdam, Textile Alliance, Inc.; 8 csk. aniline, Rotterdam, H. A. Metz & Co.; 1 csk. aniline, Rotterdam, A. Kramer & Co.; 5 csk. aniline, Rotterdam, Order; 5 csk. aniline, Liverpool, A. Klipstein & Co.; 8 csk. aniline, Hamburg, Kuttroff, Pickhardt & Co.; 10 bbl., Genoa, American Exchange Nat'l. Bank; 6 bbl. aniline, Genoa, Banco Comm. Italo; 1 bbl. aniline, Genoa, Order.

COPPERAS—55 bbl., Liverpool, Order; 24 csk., Hamburg, Order.

COPRA — 171 sk., Bonacca, Franklin Baker & Co.; 12 bg., San Juan, Order; 385 bg., Port Antonio, Atlantic Navigation Co.; 233 bg., Port Antonio, W. Schall & Co.

CREAM TARTAR—200 csk., Rotterdam, W. Van Doorn.

DIVI-DIVI—831 bg., Maracaibo, American Trading Co.

DYEWOOD—2,300 logs, Barahona, First National Bank.

FLUORSPAR—667 bg., Genoa, Order.

FUSEL OIL—28 dr., Genoa, Credito Italia of London; 12 dr., Valencia, Guaranty Trust Co.

FUSTIC—3,159 pcs., Corinto, C. H. Pearson & Son; 201 pcs., Arenas, Order; 90 tons, Port Antonio, C. H. Pearson & Son.

GLAUBERS SALT—100 bbl., Hamburg, Philipp Bauer & Co.

GUMS—220 pkg. copal, Singapore, Guaranty Trust Co.; 50 cs. copal, Singapore, Baring Bros. & Co.; 272 bg. damar, Singapore, L. C. Gillespie & Sons; 201 bg. copal, Singapore, Order; 272 bg. copal, Antwerp, Chemical National Bank; 1,160 bg. copal, Antwerp, Central Union Trust Co.; 72 bg. copal, Antwerp, W. Schall & Co.; 715 bg. copal, Antwerp, Order; 100 cs. damar, Batavia, Catz American Co.; 100 cs. damar, Batavia, Chemical National Bank; 200 cs. damar, National City Bank; 50 bg. damar, Singapore, Order; 67 bg. karaya, Bombay, Mech. & Metals Nat'l Bank; 115 bg. ghatty, Bombay, Br. Bank of South America; 133 bg. karaya, Bombay, Brown Bros. & Co.; 116 pkg. tragacanth, Bombay, Goschens & Cunliffe; 15 cs. do., Bombay, American Exchange Nat'l. Bank; 267 bg. karaya, Bombay, Order; 20 pkg. copal, Antwerp, Brown Bros. & Co.; 50 cs. damar and 50 cs. copal, Singapore, Standard Bank of South Africa; 300 bg. copal, Singapore, Order; 400 cs. damar, 700 bg. do., and 100 bg. copal, Penang, Order.

IRON OXIDE—48 bbl., Malaga, Nat'l. City Bank; 342 bbl., Malaga, Hummel & Robinson Corp.; 67 bg., Malaga, Order; 5 csk., Liverpool, Hanson & Van Winkle Co.; 31 csk., Liverpool, Battery Park Nat'l Bank; 41 csk., Liverpool, J. A. McNulty.

LOGWOOD EXTRACT—75 csk., Kingston, West Indies Chemical Works.

LITHOPONE — 8 csk., Rotterdam, B. Moore & Co.; 60 csk., Bremen, Order.

MAGNESIUM METAL—20 cs., Hamburg, C. W. Leavitt & Co.

MAGNESIUM SUPEROXIDE — 5 cs., Hamburg, Order.

MAGNESIUM CHLORIDE — 185 csk., Hamburg, Order.

MAGNESITE — 107 bbl., Rotterdam, Speiden, Whitfield Co.; 92 csk. calcined, Rotterdam, H. J. Baker & Bro.

MYROBALANS—9,307 bg., Bombay, Order; 3,563 bg. whole and 6,143 bg. crushed, Calcutta, National City Bank.

MENTHOL—10 cs., London, A. Stallman & Co.

MANGROVE BARK—1,000 bg., Singapore, Order.

NAPHTHALENE—500 dbl. bg., Rotterdam, Lunham & Moore; 365 bg., Rotterdam, Order.

OILS—Cod—10 csk., St. Johns, Order. **China Wood**—300 bbl. Shanghai, Mitsubishi Shoji Kaisha, Ltd., 295 bbl., Shanghai, W. R. Grace & Co.; 112 csk., Hong Kong, Bank of the Manhattan Co.; 49 dr., London, Order; 6,120 csk., Hankow, Standard Bank of South Africa. **Coconut**—675 tons (bulk), Manila, Philippine Refining Co. **Olive**—275 bbl., Sevilla, Bank of the Manhattan Co.; 205 bbl., Malaga, National City Bank. **Palm**—159 bbl., Belawan, United Steel Products Co. **Sesame**—28 dr., Rotterdam, Order. **Tar**—12 bbl., London, Order.

OIL SEEDS—Castor—2,716 bg., Bombay, Order; 5,464 bg., Coconada, Volkart Bros.; 4,559 bg., Coconada, L. Dreyfus.

POTASSIUM SALTS — 80 csk. nitrate, Rotterdam, Superfos Co.; 20 csk. carbonate, Bremen, P. H. Petry & Co.; 2,000 bg. muriate, Hamburg, Potash Importing Corp. of Am.; 1,000 bg. nitrate, Antwerp, Order.

PARAPHENYLENEDIAMINE — 6 cs., Hamburg, Franklin Import & Export Co.

PLUMBAGO—158 bbl., Colombo, Brown Bros. & Co.; 425 bbl., Colombo, Irving Bank-Col. Trust Co.; 341 bbl., Colombo, Battery Park Nat'l Bank; 100 bbl., Colombo, N. Y. Trust Co.

PYRIDINE—1 dr., Rotterdam, Lunham & Moore.

QUICKSILVER — 60 flask, Vera Cruz, Poillon & Poirier; 1,000 flask, Alicante, Order.

QUEBRACHO—25,934 bg., Buenos Aires, International Products Co.

PYRITES—4,751,480 kilos, Huelva, The Pyrites Co.

RUBBER — 393,091 lb. liquid latex in bulk, Belawan, General Rubber Co.

SHELLAC—150 bg. and 50 cs., London, Order; 40 bg., garnet, Hamburg, Kasebier, Chalfield Shellac Co.

SODIUM SALTS—50 cs., bromide, Hamburg, American Kreuger & Toll Co.; 265 dr. sulphite, Hamburg, C. S. Grant & Co.

SIENNA—63 csk., Genoa, Reichard-Coulston, Inc.

STARCH—250 bg. potato, Rotterdam, A. Hoffmann & Co.

SUMAC—350 bg., Palermo, American Express Co.; 350 bg., Palermo, Core & Herbert.

TALC—300 bg., Genoa, C. Matheiu; 200 bg., Genoa, L. A. Salomon & Bros.; 500 bg., Genoa, Parfums de Luxe; 1,000 bg., Genoa, Italian Discount & Trust Co.

TARTAR—222 bg., Valencia, C. Pfizer & Co.; 87 bg., Genoa, Royal Baking Powder Co.

TURPENTINE — 41 bbl., Rotterdam, Order.

WOOL GREASE—30 csk., Bremen, Pfaltz & Bauer; 90 csk., Antwerp, Order.

WAXES — 1,360 bg. paraffine, London, Order; 10 bg. bees, Rotterdam, W. Van Doorn; 30 pkt. bees, Hamburg, Order; 48 bg. bees, South Pacific Ports, Order.

WHITING—1,000 bg., Antwerp, Bankers Trust Co.

ZINC OXIDE—100 bbl., Antwerp, Reichard-Coulston, Inc.

ZINC WHITE — 20 csk., Southampton, Houbigant, Inc.

Latest Quotations on Industrial Stocks

	Last Week	This Week
Air Reduction	66¼	66
Allied Chem. & Dye	65⅞	65⅜
Allied Chem. & Dye pfd	109	107½
Am. Ag. Chem.	15	13⅜
Am. Ag. Chem. pfd	38	37
American Cotton Oil	6½	6½
American Cotton Oil pfd	20	20
American Cyanamid	69	*69
Am. Drug Synd.	4¼	4¼
Am. Linseed Co.	20⅜	18⅜
Am. Linseed pfd.	40	40
Am. Smelting & Refining Co.	58⅜	57⅜
Am. Smelting & Refining pfd.	97	96½
Archer-Daniels Mid. Co., w.i.	26	26
Archer-Daniels Mid. Co., pfd.	91	92
Atlas Powder	54	54½
Casein Co. of Am.	*62	*62
Certain-Teed Products	*30	*30
Commercial Solvents "A"	*31	*32
Corn Products	125	123⅜
Corn Products pfd	119	118
Davison Chem.	49⅞	47½
Dow Chem. Co.	*45	*45
Du Pont de Nemours	132½	124
Du Pont de Nemours db.	87	85
Freeport-Texas Sulphur	15⅜	12½
Glidden Co.	*9	7
Grasselli Chem.	*132	*132
Grasselli Chem. pfd.	*105	*105
Hercules Powder	110	110
Hercules Powder pfd	107	107
Heyden Chem.	1¼	1½
Int'l Ag. Chem. Co.	*3	*3
Int'l Ag. Chem. pfd.	10	7½
Int'l Nickel	12⅜	11⅜
Int'l Nickel pfd	78	77⅜
Int'l Salt	*89½	*89½
Mathieson Alkali	41	39
Merck & Co.	78	*80
National Lead	125	120
National Lead pfd.	112¾	113½
New Jersey Zinc	152	152
Parke, Davis & Co.	78	78
Pennsylvania Salt	*81	*88
Procter & Gamble	*128	*130
Sherwin-Williams	32⅜	32
Sherwin-Williams pfd.	102	*100½
Tenn. Copper & Chem.	9⅜	9⅜
Texas Gulf Sulphur	56¾	57
Union Carbide	55	54½
United Drug	79½	79
United Dyewood	*45	*45
U. S. Industrial Alcohol	52⅜	48⅞
U. S. Industrial Alcohol pfd.	*100	*100
Va.-Car. Chem. Co.	10⅜	9⅞
Va.-Car. Chem. pfd.	29½	26

*Nominal. Other quotations based on last sale.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

General Chemicals

Acetone, drums	lb.	$0 25 –	$0.25½
Acid, acetic, 28%, bbl.	100 lb.	3.38 –	3.50
Acetic, 56%, bbl.	100 lb.	6.75 –	7.00
Acetic, 80%, bbl.	100 lb.	9.58 –	9.83
Glacial, 99½%, bbl.	100 lb.	12.00 –	12.78
Acetic anhydride, 85%, dr.	lb.	.38 –	....
Boric, bbl.	lb.	.10 –	....
Citric, kegs	lb.	.49 –	.50
Formic, 85%	lb.	.12 –	.14
Gallic, tech.	lb.	.45 –	.50
Hydrofluoric, 52%, carboys	lb.	.11 –	.12
Lactic, 44%, tech., light, bbl.	lb.	.11½ –	.12
22% tech., light, bbl.	lb.	.05½ –	.06
Muriatic, 18° tanks	100 lb.	.90 –	1.00
Muriatic, 20°, tanks	100 lb.	1.00 –	1.10
Nitric, 36°, carboys	lb.	.04½ –	.05
Nitric, 42°, carboys	lb.	.06 –	.06½
Oleum, 20%, tanks	ton	18.50 –	19.00
Oxalic, crystals, bbl.	lb.	.11½ –	.12
Phosphoric, 50% carboys	lb.	.07½ –	.08½
Pyrogallic, resublimed	lb.	1.50 –	1.60
Sulphuric, 60°, tanks	ton	9.00 –	11.00
Sulphuric, 60°, drums	ton	13.00 –	14.00
Sulphuric, 66°, tanks	ton	15.00 –	16.00
Sulphuric, 66° drums	ton	20.00 –	21.00
Tannic, U.S.P., bbl.	lb.	.65 –	.70
Tannic, tech., bbl.	lb.	.45 –	.50
Tartaric, imp., powd., bbl.	lb.	.32 –	.33
Tartaric, domestic, bbl.	lb.	.36 –	....
Tungstic, per lb.	lb.	1.10 –	1.20
Alcohol, butyl, drums, f.o.b. works	lb.	.26 –	.28
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.78 –	....
Ethyl, 190 p'f. U.S.P., bbl.	gal.	4.75 –	....
Alcohol, methyl (see Methanol)			
Alcohol, denatured, 190 proof			
No. 1, special bbl.	gal.	.46 –	....
No. 1, 190 proof, special, dr.	gal.	.40 –	....
No. 1, 188 proof, bbl.	gal.	.47 –	....
No. 1, 188 proof, dr.	gal.	.41 –	....
No. 5, 188 proof, bbl.	gal.	.45 –	....
No. 5, 188 proof, dr.	gal	.39 –	....
Alum, ammonia, lump, bbl.	lb.	.03½ –	.04
Potash, lump, bbl.	lb.	.03 –	.04½
Chrome, lump, potash, bbl.	lb.	.06 –	.07
Aluminum sulphate, com., bags	100 lb.	1.40 –	1.50
Iron free bags	lb.	2.40 –	2.50
Aqua ammonia, 26°, drums	lb.	.07 –	.07½
Ammonia, anhydrous, cyl.	lb.	.30 –	.30½
Ammonium carbonate, powd. casks, imported	lb.	.09½ –	.10
Ammonium carbonate, powd. domestic, bbl.	lb.	.13 –	.14
Ammonium nitrate, tech., casks	lb.	.10 –	.11
Amyl acetate tech., drums	gal.	4.50 –	4.75
Antimony Sulphuret, golden	lb.	.19 –	.20
Arsenic, white, powd., bbl.	lb.	.11 –	.11½
Arsenic, red, powd., kegs	lb.	.15½ –	.15¾
Barium carbonate, bbl.	ton	68.00 –	70.00
Barium chloride, bbl.	ton	82 00 –	88.00
Barium dioxide, drums	lb.	.18 –	.18½
Barium nitrate, casks		.07½ –	.08
Blanc fixe, dry, bbl.	lb.	.04 –	.04½
Bleaching powder, f.o.b. wks., drums	100 lb.	1.50 –	1.75
Spot N. Y. drums	100 lb.	2.00 –	2.10
Borax, bbl.	lb.	.05½ –	.05¾
Bromine, cases	lb.	.28 –	.30
Calcium acetate, bags	100 lb.	4.00 –	4.05
Calcium arsenate, dr.	lb.	.13 –	.14
Calcium carbide, drums	lb.	.05½ –	.05¾
Calcium chloride, fused, dr. wks.	ton	21.00 –	....
Gran. drums works	ton	27.00 –	....
Calcium phosphate, mono, bbl.	lb.	.06½ –	.07
Camphor, cases	lb.	.87 –	.89
Carbon bisulphide, drums	lb.	.07 –	.07½
Carbon tetrachloride, drums	lb.	.09 –	.09½
Chalk, precip.—domestic, light, bbl.	lb.	.04½ –	.04¾
Domestic, heavy, bbl.	lb.	.03½ –	.03¾
Imported, light, bbl.	lb.	.04½ –	.05
Chlorine, liquid, tanks, wks.	lb.	.05½ –	.05¾
Cylinders, 100 lb., wks.	lb.	.06 –	.06½
Cylinders, 100 lb., spot	lb.	.09 –	....
Chloroform, tech., drums	lb.	.28 –	.32
Cobalt, oxide, bbl.	lb.	2.10 –	2.25
Copperas, bulk, f.o.b. wks.	ton	22.00 –	25.00
Copper carbonate, bbl.	lb.	.18 –	.19
Copper cyanide, drums	lb.	.47 –	.50
Coppersulphate, dom., bbl.,	100 lb.	5.00 –	5.15
Imp. bbl.	100 lb.	4.50 –	4.75
Cream of tartar bbl.	lb.	.24½ –	.26
Epsom salt, dom., tech., bbl.	100 lb.	1.75 –	2.00
Epsom salt, imp., tech., bags	100 lb.	.90 –	1.00
Epsom salt, U.S.P., dom., bbl.	100 lb.	2.25 –	2.50
Ether, U.S.P., resale, dr.	lb.	.13 –	.15
Ethyl acetate, 85%, drums	gal.	.80 –	.81
Ethyl acetate, ether, 98% to 100%	gal.	$0 95 –	$1.00
Formaldehyde, 40%, bbl.	lb.	.12 –	.12½
Fullers earth—imp., powd., net	ton	30.00 –	32.00
Fusel oil, ref., drums	gal.	.... –	....
Fusel oil, crude, drums	gal.	4.25 –	....
Glaubers salt, wks., bags	100 lb.	1.20 –	1.40
Glaubers salt, imp., bags	100 lb.	.90 –	.95
Glycerine, c.p., drums extra	lb.	.17 –	.17½
Glycerine, dynamite, drums	lb.	.16½ –	....
Glycerine, crude 80%, loose	lb.	.11 –	....
Iron oxide, red, casks	lb.	.12 –	.18
Lead:			
White, basic carbonate, dry, casks	lb.	.09½ –	.09¾
White, basic sulphate, casks	lb.	.08½ –	.09
White, in oil, kegs	lb.	.11½ –	.11¾
Red, dry, casks	lb.	.10½ –	.10¾
Red, in oil, kegs	lb.	.13 –	.14½
Lead acetate, white crys., bbl.	lb.	.14 –	.14½
Brown, broken, casks	lb.	.13 –	.13½
Lead arsenate, powd., bbl.	lb.	.18 –	.20
Lime-Hydrated, bg, wks.	ton	10.50 –	12.50
Bbl., wks.	ton	18.00 –	19.00
Lime, Lump, bbl.	280 lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.10½ –	.10¾
Lithophone, bags	lb.	.07 –	.07¼
in bbl.	lb.	.07½ –	.07¾
Magnesium carb., tech., bags	lb.	.08 –	.08½
Methanol, 95%, bbl.	gal.	1.05 –	....
Methanol, 97%, bbl.	gal.	1.07 –	....
Methyl-acetone, t'ks.	gal.	1.15 –	....
Nickel salt, double, bbl.	lb.	.10½ –	....
Nickel salts, single, bbl.	lb.	.11½ –	....
Phosgene		.60 –	.75
Phosphorus, red, cases	lb.	.... –	....
Phosphorus, yellow, cases	lb.	.35 –	.40
Potassium bichromate, casks	lb.	.09½ –	.09¾
Potassium bromide, gran., bbl.	lb.	.19 –	.20
Potassium carbonate, 80-85%, calcined, casks	lb.	.06½ –	.06¾
Potassium chlorate, powd.	lb.	.07 –	.08½
Potassium cyanide, drums	lb.	.47 –	.52
Potassium, first sorts, cask	lb.	.07½	.07¾
Potassium hydroxide (caustic potash) drums	lb.	.07 –	.09
Potassium iodide, cases	lb.	3.65 –	3.75
Potassium nitrate, bbl.	lb.	.07½ –	.09
Potassium permanganate, drums	lb.	.17½ –	.18
Potassium prussiate, red, casks	lb.	.60 –	.63
Potassium prussiate, yellow, casks	lb.	.30 –	....
Salammoniac, white, gran., casks, imported	lb.	.06½ –	.06½
Salammoniac, white, gran., bbl., domestic	lb.	.07½ –	.07¾
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl.	100 lb.	1.20	1.40
Salt cake (bulk)	ton	26.00 –	28.00
Soda ash, light, 58% flat, bulk, contract	100 lb.	1.33 –	....
bags, contract	100 lb.	1.45 –	....
Soda ash, dense, bulk, contract, basis 58%	100 lb.	1.42 –	....
bags, contract	100 lb.	1.51 –	....
Soda, caustic, 76%, solid, drums contract	100 lb.	3.16 –	....
Soda, caustic, ground and flake, contracts, dr.	100 lb.	3.60 –	3.85
Soda, caustic, solid, 76% f. a. s. N. Y.	100 lb.	3.10 –	3.15
Sodium acetate, works, bags	lb.	.05½ –	.05¾
Sodium bicarbonate, bbl.	100 lb.	2.00 –	....
Sodium bichromate, casks	lb.	.07½ –	.07¾
Sodium bisulphate (niter cake)	ton	6.00 –	7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb.	.04½ –	.04¾
Sodium chlorate, kegs	lb.	.06½ –	.07
Sodium chloride	long ton	12.00 –	13.00
Sodium cyanide, cases	lb.	.19 –	.22½
Sodium fluoride, bbl.	lb.	$0.08½ –	$0.10½
Sodium hyposulphite, bbl.	lb.	.02½ –	.02¾
Sodium nitrite, casks	lb.	.07¼ –	....
Sodium peroxide, powd., cases	lb.	.28 –	.30
Sodium phosphate, dibasic, bbl.	lb.	.03½ –	.04
Sodium prussiate, yel. drums	lb.	.13½ –	.14
Sodium salicylic, drums	lb.	.40 –	.45
Sodium silicate (40°, drums)	100 lb.	.75 –	1.15
Sodium silicate (60°, drums)	100 lb.	1.75 –	2.00
Sodium sulphide, fused, 60-62% drums	lb.	.03 –	.04
Sodium sulphite, crys., bbl.	lb.	.03½ –	.03¾
Strontium nitrate, powd., bbl.	lb.	.10 –	.11
Sulphur chloride, yel drums	lb.	.04½ –	.05
Sulphur, crude	ton	18.00 –	20.00
At mine, bulk	ton	16.00 –	18.00
Sulphur, flour, bag	100 lb.	2.25 –	2.35
Sulphur, roll, bag	100 lb.	2.00 –	2.10
Sulphur dioxide, liquid, cyl.	lb.	.08 –	.08½
Tin bichloride, bbl.	lb.	.12 –	.12½
Tin oxide, bbl.	lb.	.47 –	....
Tin crystals, bbl.	lb.	.31½ –	.32
Zinc carbonate, bags	lb.	.14 –	.14½
Zinc chloride, gran, bbl.	lb.	.06½ –	.06¾
Zinc cyanide, drums	lb.	.37 –	.38
Zinc oxide, , lead free, bbl.	lb.	.08 –	.08½
5% lead sulphate, bags	lb.	.07½ –	....
10 to 35 % lead sulphate, bags	lb.	.07 –	....
French, red seal, bags	lb.	.09½ –	....
French, green seal, bags	lb.	.10½ –	....
French, white seal, bbl.	lb.	.12 –	....
Zinc sulphate, bbl.	100 lb.	2.75 –	3.25

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.60 –	$0.70
Alpha-naphthol, ref., bbl.	lb.	.65 –	.80
Alpha-naphthylamine, bbl.	lb.	.35 –	.36
Aniline oil, drums	lb.	.16 –	.16½
Aniline salts, bbl.	lb.	.23 –	.24
Anthracene, 80%, imp., drums, duty paid	lb.	.65 –	.70
Anthraquinone, 25%, paste, drums	lb.	.80 –	.85
Benzaldehyde U.S.P., carboys	lb.	1.50 –	....
f.f.c. drums	lb.	1.60 –	....
tech, drums	lb	75	....
Benzene, pure, water-white, tanks and drums	gal.	.27 –	....
Benzene, 90%, tanks & drums	gal.	.25 –	....
Benzidine base, bbl.	lb.	.80 –	.85
Benzidine sulphate, bbl.	lb.	.75 –	....
Benzoic acid, U.S.P., kegs	lb.	.80 –	.85
Benzoate of soda, U.S.P., bbl.	lb.	.65 –	.70
Benzyl chloride, 95-97%, ref., drums	lb.	.45 –	....
Benzyl chloride, tech., drums	lb.	.30 –	.35
Beta-naphthol, tech., bbl.	lb.	.21 –	.22
Beta-naphthylamine, tech.	lb.	.75 –	.80
Cresol, U.S.P., drums	lb.	.25 –	.29
Ortho-cresol, drums	lb.	.28 –	.32
Cresylic acid, 97%, works drums	gal.	.75 –	.85
95-97%, drums, works	gal.	.70 –	.75
Dichlorbenzene, drums	lb.	.06 –	.08
Diethylaniline, drums	lb.	.50 –	.60
Dimethylaniline, drums	lb.	.41 –	.42
Dinitrobenzene, bbl.	lb.	.19 –	.20
Dinitrochlorbenzene, bbl.	lb.	.21 –	.22
Dinitronaphthalen, bbl.	lb.	.30 –	.32
Dinitrophenol, bbl.	lb.	.35 –	.40
Dinitrotoluen, bbl.	lb.	.20 –	.22
Dip oil, 25%, drums	gal.	.25 –	.30
Diphenylamine, bbl.	lb.	.50 –	.52
H-acid, bbl.	lb.	.75 –	.80
Meta-phenylenediamine, bbl.	lb.	1.00 –	1 05
Michlers ketone, bbl.	lb.	3.00 –	3.50
Monochlorbenzene, drums	lb.	.08 –	.10
Monoethylaniline, drums	lb.	.95 –	1.10
Naphthalene, flake, bbl.	lb.	.06½ –	.07
Naphthalene, balls, bbl.	lb.	.07½ –	.07¾
Naphthionate of soda, bbl.	lb.	.58 –	.65
Naphthionic acid, crude, bbl.	lb.	.55 –	.60
Nitrobenzene, drums	lb.	.09½ –	.10¼
Nitro-naphthalene, bbl.	lb.	.30 –	.35
Nitro-toluene, drums	lb.	.13½ –	.14¼
N-W acid, bbl.	lb.	1.20 –	1.25
Ortho-amidophenol, kegs	lb.	2.30 –	2.35
Ortho-dichlorbenzene, drums	lb.	.15 –	.17
Ortho-nitrophenol, bbl.	lb.	1.20 –	1.30
Ortho-nitrotoluene, drums	lb.	.10 –	.12
Ortho-toluidine, bbl.	lb.	.18 –	.20
Para-amifiophenol, base, kegs	lb.	1.35 –	....
Para-amifiophenol, HCl, kegs	lb.	1.55 –	....
Para-dichlorbenzene, bbl.	lb.	.17 –	.20
Paranitroaniline, bbl.	lb.	.72 –	.74
Para-nitrotoluene, bbl.	lb.	.60 –	.65
Para-phenylenediamine, bbl.	lb.	1.45 –	1.50
Para-toluidine, bbl	lb.	.90 –	.95
Phthalic anhydride, bbl.	lb.	.32 –	.36
Phenol, U.S.P., dr.	lb.	.28 –	.30
Picric acid, bbl.	lb.	.20 –	.22
Pyridine, dom., drums	gal.	nominal	
Pyridine, imp., drums	gal.	5.00 –	5.25
Resorcinol, tech., kegs	lb.	1.40 –	1.50

Resorcinol, pure, kegs	lb.	$2.15 –	$2.25
R-salt, bbl.	lb.	.55 –	.60
Salicylic acid, tech., bbl.	lb.	.32 –	....
Salicylic acid, U.S.P., bbl.	lb.	.35 –	....
Solvent naphtha, water-white, tanks	gal.	.27 –	....
Crude, tanks	gal.	.24 –	....
Sulphanilic acid, crude, bbl.	lb.	.18 –	.20
Thiocarbanilide, kegs	lb.	.35 –	.38
Tolidine, bbl	lb.	1.00 –	1.05
Toluidine, mixed, kegs	lb.	.30 –	.35
Toluene, tank cars	gal.	.30 –	.32
Toluene, drums	gal.	.34 –	.36
Xylidine drums	lb.	.50 –	....
Xylene, pure, drums	gal.	.60 –	.65
Xylene, com., drums	gal.	.32 –	.34
Xylene, com., tanks	gal.	.28 –	.30

Naval Stores

Rosin B-D, bbl. 280 lb.		$5.85 –	.....
Rosin E-I, bbl. 280 lb.		5.95 –	.....
Rosin K-N, bbl. 280 lb.		6.00 –	.....
Rosin W.G.-W.W., bbl. 280 lb.		6.50 –	$7.00
Wood rosin bbl. 280 lb.		5.90 –	6.00
Turpentine, spirits of, bbl.	gal.	.99 –	.....
Wood, steam dist., bbl.	gal.	.85 –	.....
Wood, dest. dist., bbl.	gal.	.70 –	.....
Pine tar pitch, bbl. 200 lb.		5.50 –	.....
Tar, kiln burned, bbl. 500 lb.		11.00 –	.....
Retort tar, bbl. 500 lb.		11.00 –	.....
Rosin oil, first run, bbl.	gal.	.45 –	.....
Rosin oil, second run, bbl.	gal.	.47 –	.....
Rosin oil, third run, bbl.	gal.	.50 –	.....
Pine oil, steam dist.	gal.	.65 –	.....
Pine oil, pure, dest. dist.	gal.	.60 –	.....
Pine tar oil, ref.	gal.	.48 –	.....
Pine tar oil, crude, tanks f.o.b. Jacksonville, Fla.	gal.	.32 –	.32½
Pine tar oil, double ref., bbl.	gal.	..... –	.75
Pine tar, ref., thin, bbl.	gal.	..... –	.25
Pinewood creosote, ref., bbl.	gal.	..... –	.52

Animal Oils and Fats

Degras, bbl.	lb.	$0.04½ –	$0.04½
Grease, yellow, bbl.	lb.	.07½ –	.07½
Lard oil, Extra No. 1, bbl.	gal.	.86 –	.88
Neatsfootoil 20 deg. bbl.	gal.	1.20 –	1.25
No. 1, bbl.	gal.	.92 –	.94
Oleo Stearine		.13 –	.....
Oleo oil, No. 1, bbl.	lb.	.12½ –	.13
Red oil, distilled, d.p. bbl.	lb.	.09½ –	.09½
Saponified, bbl.	lb.	.09½ –	.09½
Tallow, extra, loose	lb.	.08 –	.....
Tallow oil, acidless, bbl.	gal.	.87 –	.89

Vegetable Oils

Castor oil, No. 3, bbl.	lb.	$0.13 –	.....
Castor oil, No. 1, bbl.	lb	.13½ –	.....
Chinawood oil, bbl.	lb.	.22 –	.22½
Coconut oil, Ceylon, bbl.	lb.	.09½ –	.....
Ceylon, tanks, N.Y.	lb.	.08½ –	.....
Coconut oil, Cochin, bbl.	lb.	.10 –	.....
Corn oil, crude, bbl.	lb.	.10½ –	.11
Crude, tanks, (f.o.b. mill)	lb.	.10 –	.....
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.10½ –	.....
Summer yellow, bbl.	lb.	.12 –	.12½
Winter yellow, bbl.	lb.	.13½ –	.13½
Linseed oil, raw, car lots, bbl.	gal.	.88 –	.....
Raw, tank cars (dom.)	gal.	.83 –	.....
Boiled, cars, bbl. (dom.)	gal.	.90 –	.....
Olive oil, denatured, bbl.	gal.	1.10 –	1.12
Sulphur, (foots) bbl.	lb.	.08½ –	.08½
Palm, Lagos, casks	lb.	.07½ –	.07½
Niger casks	lb.	.07½ –	.07½
Palm kernel, bbl.	lb.	.08½ –	.....
Peanut oil, crude, tanks (mill)	lb.	.13 –	.....
Peanut oil, refined, bbl.	lb.	.14½ –	.....
Perilla, bbl	lb	.14½ –	.14½
Rapeseed oil, refined, bbl.	gal.	.76 –	.....
Rapeseed oil, blown, bbl.	gal.	.82 –	.....
Sesame, bbl	lb.	.12½ –	.12½
Soya bean (Manchurian), bbl.	lb.	.10½ –	.....
Tank, f.o.b. Pacific coast	lb.	.09 –	.....
Tank, (f.o.b. N.Y.)	lb.	.09¼ –	.....

Fish Oils

Cod, Newfoundland, bbl.	gal.	$0.64 –	$0.65
Menhaden, light pressed, bbl.	gal.	.60 –	.....
White bleached, bbl.	gal.	.62 –	.....
Blown, bbl.	gal.	.67 –	.....
Crude, tanks (f.o.b. factory)	gal.	.45 –	.....
Whale No. 1 crude, tanks, coast	lb.	..... –	.....
Winter, natural bbl.	gal.	.76 –	.78
Winter, bleached bbl.	gal.	.79 –	.80

Oil Cake and Meal

Coconut cake, bags	ton	$30.00 –	$31.00
Copra, sun dried, bags, (c.i.f.)	lb.	.05½ –	.....
Sun dried Pacific coast	lb.	.04½ –	.04½
Cottonseed meal, f.o.b. mills	ton	39.00 –	.....
Linseed cake, bags	ton	37.00 –	.....
Linseed meal, bags	ton	45.00 –	47.00

Dye & Tanning Materials

Albumen, blood, bbl.	lb.	$0.45 –	$0.50
Albumen, egg, tech, kegs	lb.	.95 –	1.00
Cochneal, bags	lb.	.32 –	.34
Cutch, Borneo, bales	lb.	.04 –	.04½
Cutch, Rangoon, bales	lb.	.15 –	.16
Dextrine, corn, bags 100 lb.		3.69 –	3.86
Dextrine, gum, bags 100 lb.		3.99 –	4.26
Divi-divi, bags	ton	38.00 –	39.00
Fustic, sticks	ton	30.00 –	35.00
Fustic, chips, bags	lb.	.04 –	.05
Logwood, sticks	ton	25.00 –	26.00
Logwood, chips, bags	lb.	.02½ –	.03
Sumac, leaves, Sicily, bags	ton	80.00 –	85.00
Sumac, ground, bags	ton	$75.00 –	$80.00
Sumac, domestic, bags	ton	40.00 –	42.00
Starch, corn, bags 100 lb.		3.12 –	3.39
Tapioca flour, bags	lb.	.07 –	.07½

Extracts

Archil, cone., bbl.	lb.	$0.18 –	$0.22
Chestnut, 25% tannin, tanks	lb.	.02 –	.03
Divi-divi, 25% tannin, bbl.	lb.	.04 –	.05
Fustic, crystals, bbl.	lb.	.20 –	.22
Fustic, liquid, 42°, bbl.	lb.	.08 –	.09
Gambier, liq., 25% tannin, bbl.	lb.	.08½ –	.09½
Hematine crys., bbl.	lb.	.14 –	.18
Hemlock, 25% tannin, bbl.	lb.	.03½ –	.04
Hypernic, solid, drums	lb.	.24 –	.26
Hypernic, liquid, 51°, bbl.	lb.	.09½ –	.10½
Logwood, crys., bbl.	lb.	.15 –	.16
Logwood, liq., 51°, bbl.	lb.	.08 –	.08½
Quebracho, solid, 65% tannin, bbl.	lb.	.04½ –	.05
Sumac, dom., 51°, bbl.	lb.	.06½ –	.07½

Dry Colors

Blacks–Carbongas, bags, f.o.b. works, spot	lb.	$0.14 –	$0.18
Lampblack, bbl.	lb.	.12 –	.40
Mineral, bulk	ton	35.00 –	45.00
Blues–Bronze, bbl.	lb.	.50 –	.55
Prussian, bbl.	lb.	.50 –	.55
Ultramarine, bbl.	lb.	.08 –	.35
Browns, Sienna, Ital., bbl.	lb.	.06 –	.14
Sienna, Domestic, bbl.	lb.	.03½ –	.04
Umber, Turkey, bbl.	lb.	.04 –	.04½
Greens–Chrome, C.P. Light, bbl.	lb.	.30 –	.32
Chrome, commercial, bbl.	lb.	.12 –	.12½
Paris, bulk	lb.	.28 –	.30
eds, Carmine No. 40, tins	lb.	4.50 –	4.70
Oxide red, casks	lb.	.10 –	.14
Para toner, kegs	lb.	1.00 –	1.10
Vermilion, English, bbl.	lb.	1.20 –	1.25
Yellow, Chrome, C.P. bbls.	lb.	.18 –	.18½
Ocher, French, casks	lb.	.02½ –	.03

Waxes

Bayberry, bbl.	lb.	$0.27 –	$0.28
Beeswax, crude, bags	lb.	.21½ –	.26½
Beeswax, refined, light, bags	lb.	.32 –	.34
Beeswax, pure white, cases	lb.	.40 –	.41
Candellila, bags	lb.	.22½ –	.23½
Carnauba, No. 1, bags	lb.	.42 –	.42½
No. 2, North Country, bags	lb.	.23 –	.23½
No. 3, North Country, bags	lb.	.17½ –	.17½
Japan, cases	lb.	.17 –	.18
Montan, crude, bags	lb.	.05 –	...
Paraffine, crude, match, 105-110 m.p., bbl.	lb.	.04½ –	.04½
Crude, scale 124-126 m.p. bags	lb.	.02½ –	.03
Ref., 118-120 m.p., bags	lb.	.03½ –	....
Ref., 125 m.p., bags	lb.	.03½ –	....
Ref. 128-130 m.p., bags	lb.	.03½ –	....
Ref., 133-135 m.p., bags	lb.	.04½ –	.04½
Ref., 135-137 m.p., bags	lb.	.05½ –	.05½
Stearic acid, agle pressed, bags	lb.	.12½ –	.12½
Double pressed, bags	lb.	.13 –	.13½
Triple pressed, bags	lb.	.14½ –	.14½

Fertilizers

Ammonium sulphate, bulk, f.o.b. works 100 lb.		$3.20 –	$3.25
F.a.s. double bags 100 lb.		3.40 –	3.50
Blood, dried, bulk	unit	4.00 –	.....
Bone, raw, 3 and 50, ground	ton	26.00 –	28.00
Fish scrap, dom., dried, wks.	unit	..... –	.....
Nitrate of soda, bags 100 lb.		2.40 –	2.52½
Tankage, high grade, f.o.b. Chicago	unit	3.25 –	3.35
Phosphate rock, f.o.b. mines, Florida pebble, 68-72%	ton	4.00 –	4.50
Tennessee, 78-80%	ton	7.75 –	8.00
Potassium muriate, 80%, bags	ton	34.55 –	.....
Potassium sulphate, bags basis 90%	ton	43.67 –	.....
Double manure salt	ton	25.72 –	.....
Kainit	ton	7.22 –	.....

Crude Rubber

Para—Upriver fine	lb.	$0.28½ –	.....
Upriver coarse	lb.	.23 –	.....
Upriver caucho ball	lb.	.24 –	.....
Plantation—First latex crepe	lb.	.29 –	.....
Ribbed smoked sheets	lb.	.29 –	.....
Brown crepe, thin, clean	lb.	.28 –	.....
Amber crepe No. 1	lb.	.28½ –	.....

Gums

Copal, Congo, amber, bags	lb.	$0.12 –	$0.18
East Indian, bold, bags	lb.	.23 –	.23½
Manila, pale, bags	lb.	.20 –	.20½
Pontinak, No. 1 bags	lb.	.20 –	.20½
Damar, Batavia, cases	lb.	.26 –	.26½
Singapore, No. 1, cases	lb.	.32 –	.33
Singapore, No. 2, cases	lb.	.23 –	.23½
Kauri, No. 1, cases	lb	.68 –	.70
Ordinary chips, cases	lb.	.21 –	.23
Manjak, Barbados, bags	lb.	.09 –	.09½

Shellac

Shellac, orange fine, bags	lb.	$0.64 –	$0.65
Orange superfine, bags	lb.	.66 –	.67
A. C. garnet, bags	lb.	.61 –	.62
Bleached, bonedry	lb.	.72 –	.73
Bleached, fresh	lb.	.62 –	.63
T. N., bags	lb.	.62 –	.63

Miscellaneous Materials

Asbestos, crude No. 1, f.o.b., Quebec	sh ton	$375.00 –	$500.00
Asbestos, shingle, f.o.b., Quebec	sh. ton	$55.00 –	$60.00
Asbestos, cement, f.o.b., Quebec	sh. ton	20.00 –	25.00
Barytes, grd., white, f.o.b. mills, bbl.	net ton	16.00 –	20.00
Barytes, grd., off-color, f.o.b. mills bulk	net ton	13.00 –	15.00
Barytes, floated, f.o.b. St. Louis, bbl.	net ton	28.00 –	.....
Barytes, crude f.o.b. mines, bulk	net ton	8.00 –	10.00
Casein, bbl., tech	lb.	.13½ –	.15½
China clay (kaolin) crude, f.o.b. Ga.	net ton	6.00 –	8.00
Washed, f.o.b. Ga.	net ton	8.00 –	9.00
Powd., f.o.b. Ga.	net ton	14.00 –	20.00
Crude f.o.b. Va.	net ton	6.00 –	8.00
Ground, f.o.b. Va.	net ton	13.00 –	19.00
Imp., lump, bulk	net ton	15.00 –	20.00
Imp., powd.	net ton	45.00 –	50.00
Feldspar, No. 1 pottery	long ton	7.50 –	.....
No. 2 pottery	long ton	6.00 –	.....
No. 1 soap	long ton	8.50 –	.....
No. 1 Canadian, f.o.b. mill	long ton	18.00 –	20.00
Graphite, Ceylon, lump, first quality, bbl.	lb.	.06 –	.06½
Ceylon, chip, bbl.	lb.	.04½ –	.05
High grade amorphous crude	ton	15.00 –	30.00
Gum arabic, amber, sorts, bags	lb.	.13½ –	.14
Gum tragacanth, sorts, bags	lb.	.50 –	.55
No. 1, bags	lb.	1.45 –	1.50
Kieselguhr, f.o.b. Cal.	ton	40.00 –	42.00
F.o.b. N. Y.	ton	50.00 –	55.00
Magnesite, crude, f.o.b. Cal.	ton	14.00 –	15.00
Pumice stone, imp., casks	lb.	.03 –	.05½
Dom., lump, bbl.	lb.	.05 –	.05½
Dom., ground, bbl.	lb.	.05½ –	.06
Silica, glass sand, f.o.b. Ind.	ton	2.00 –	2.50
Silica, sand blast, f.o.b. Ind.	ton	2.50	5.00
Silica, amorphous, 250-mesh, f.o.b. Ill.	ton	17.00 –	17.50
Silica, glass sand, f.o.b. Ill.	ton	1.50 –	3.00
Soapstone, coarse, f.o.b. Vt., bags	ton	7.00 –	8.00
Talc, 200 mesh, f.o.b., Vt., bags, extra	ton	6.00 –	8.00
Talc, 200 mesh, f.o.b. Ga., bags	ton	7.00 –	9.00
Talc, 200 mesh, f.o.b. Los Angeles, bags	ton	18.00 –	20.00

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$2.50 –	2.75
Corning	bbl.	1.45 –	.....
Cabell	bbl.	1.35 –	.....
Somerset	bbl.	1.25 –	.....
Illinois	bbl.	1.47 –	.....
Indiana	bbl.	1.48 –	.....
Kansas and Oklahoma, 28 deg.	bbl.	.70 –	.....
California, 35 deg. and up	bbl.	1.04 –	.....

Gasoline, Etc.

Motor gasoline, steel bbls	gal.	$0.18½ –	.....
Naphtha, V. M. & P. deod, steel bbls	gal	.17½ –	.....
Kerosene, ref. tank wagon	gal.	.14 –	.....
Bulk, W.W. delivered, N.Y.	gal.	.06 –	.....
Lubricating oils:			
Cylinder, Penn., dark	gal.	.21½ –	.....
Bloomless, 30@31 grav.	gal.	.17½ –	.....
Paraffin, pale	gal.	.15 –	.17
Spindle, 200, pale	gal.	.20½ –	.21
Petrolatum, amber, bbls	lb.	.03½ –	.04
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	1,000	$140–145
Chrome brick, f.o.b. Eastern shipping points	ton	50–52
Chrome cement, 40-50% Cr_2O_3	ton	23–27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	45–48
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	38–42
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton	65–68
9-in. arches, wedges and keys	ton	80–85
Scraps and splits	ton	85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	53–55
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	53–54
F.o.b. Mt. Union, Pa.	1,000	45–47
Silicon carbide refract. brick, 9-in.	1,000	1,100.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N.Y.	ton	$200.00 –	$225.00
Ferrochromium, per lb. of Cr, 1-2% C	lb.	.28 –	.30
4-6% C	lb.	.12 –	...
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	117.50 –	.....
Spiegeleisen, 19-21% Mn.	gr. ton	45.00 –	47.00
Ferromolybdenum, 50-60% Mo, per lb Mo	lb.	2.00 –	2.50
Ferrosilicon, 10-12%	gr. ton	43.00 –	50.00
50%	gr. ton	85.00 –	.....

Ferrotungsten, 70–80%, per lb. of W	lb.	$0.85 @ $0.95
Ferro-uranium, 35-50% of U. per lb. of U	lb.	4.50 – ....
Ferrovanadium, 30-40%, per lb. of V	lb.	3.50 – 4.50

Ores and Semi-finished Products

Bauxite, dom. crushed dried, f.o.b. shipping points	ton	$5.50 – $8.75
Chrome ore, Calif. concentrates, 50% min. Cr_2O_3	ton	22.00 – 23.00
C.i.f. Atlantic seaboard	ton	21.00 – 25.00
Coke, fdry., f.o.b. ovens	ton	5.75 – 6.25
Coke, furnace, f.o.b. ovens	ton	4.75 – 5.00
Fluorspar, gravel, f.o.b. mines' Illinois	ton	23.50 –.....
Ilmenite, 52% TiO_2	lb.	.01½– .01¾
Manganese ore, 50% Mn c.i.f. Atlantic seaport	unit	.40 –.....
Manganese ore, chemical (MnO_2)	ton	75.00 – 80.00
Molybdenite, 85% MoS_2, per lb. MoS_2, N. Y.	lb.	.75 –.....
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 – .08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½– .12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.11½– .12
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12 –.....
Rutile, 95% TiO_2	lb.	.12 –.....
Tungsten, scheelite, 60% WO_3 and over	unit	9.50 – 10.00
Tungsten, wolframite, 60% WO_3	unit	8.75 – 9.00
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 – 3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	2.25 – 2.50
Vanadium pentoxide, 99%	lb.	12.00 – 14.00
Vanadium ore, per lb. V_2O_5	lb.	.75 – 1.00
Zircon	ton	50.00 –.....

Non-Ferrous Materials

	Cents per Lb.
Copper, electrolytic	13–13¾
Aluminum, 98 to 99%	25–27
Antimony, wholesale, Chinese and Japanese	7½– 7¾
Nickel, virgin metal	27–29
Nickel, ingot and shot	30–32
Monel metal, shot and blocks	32.00
Monel metal, ingots	38.00
Monel metal, sheet bars	45.00
Tin, 5-ton lots, Straits	41.37½
Lead, New York, spot	6.85
Lead, E. St. Louis, spot	6.70
Zinc, spot, New York	6.75
Zinc, spot, E. St. Louis	6.40

Other Metals

Silver (commercial)	oz.	$0.64½
Cadmium	lb.	1.00
Bismuth (500 lb. lots)	lb.	2.55
Cobalt	lb.	3.00-3.25
Magnesium, ingots, 99%	lb.	1.25–.....
Platinum	oz.	116.00
Iridium	oz.	275.00@300.00
Palladium	oz.	80.00
Mercury	75 lb.	62.00–64.00

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	20 25
Copper bottoms	30 75
Copper rods	20 75
High brass wire	19 00
High brass rods	16 75
Low brass wire	20 75
Low brass rods	21 00
Brazed brass tubing	24 00
Brazed bronze tubing	27 00
Seamless copper tubing	25.50
Seamless high brass tubing	24 00

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

Copper, heavy and crucible	9.00@ 9 25
Copper, heavy and wire	11 25@ 11 50
Copper, light and bottoms	10.25@ 10 50
Lead, heavy	5.50@ 5.62½
Lead, tea	3.50@ 3 75
Brass, heavy	6.25@ 6 50
Brass, light	5.25@ 5 50
No. 1 yellow brass turnings	6.00@ 6.25
Zinc scrap	3.75@ 4.00

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	$3.54	$3.54
Soft steel bars	3.54	3.54
Soft steel bar shapes	3.54	3.54
Sft steel bands	4.39	4 39
Plates, ¼ to 1 in. thick	3 64	3.64

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Alabama

MONTGOMERY—The Gulf States Chemical & Refining Co., American Trust Bldg., Birmingham, Ala., is perfecting plans for the establishment of a new plant at Montgomery, where property has been acquired. The works will be used primarily for the manufacture of calcium arsenate for boll weevil elimination, with initial output of about 20 tons per day. The equipment installation will include filter presses, mechanical driers, pulverizers, agitators, pumps, tanks and auxiliary apparatus. John M. Gallalee is in charge.

Arkansas

LITTLE ROCK—The Arkansas Bauxtite Products Co., recently organized, has tentative plans under consideration for the operation of a plant for the manufacture of alum and kindred specialties. George W. Goodman is secretary and treasurer.

California

RIVERSIDE—The Golden Seal Refining Corp. has preliminary plans for the erection of a new gasoline-refining plant on site near Riverside, estimated to cost about $150,000, with equipment, of which a list will be prepared at an early date. Local offices have been opened in the Glenwood Mission Garage Bldg., West 7th St.

LOS ANGELES—The Shell Oil Co. of California, 343 Sansom St., San Francisco, is rushing construction on its new oil and gasoline refining plant at Wilmington, Los Angeles Harbor, and purposes to have the works ready for service during November. It is expected to develop an initial output of about 20,000 bbl. per day.

LOS ANGELES—Officials of the Pacific Steel Corp., recently formed by interests allied with the Pacific Coast Steel Co., Rialto Bldg., San Francisco, have organized the Pacific Coke & Coal Co., with capital of $7,500,000, to carry out the proposed steel plant project on waterfront site between Los Angeles and Long Beach. The initial works as now projected will consist of a blast furnace with daily capacity of about 600 tons of pig iron, and battery of 50 byproduct coke ovens. It is purposed to have construction completed within 24 months.

Florida

SOUTH JACKSONVILLE — The Leesburg Fibre Pulp & Paper Co., Leesburg, Fla., has closed negotiations for the purchase of local property adjoining the shipyard of the Merrill-Stevens Co., and will proceed immediately with plans for its proposed paper mill, to be devoted to the production of wrapping and kraft papers. The main mill will be 50x300 ft., with adjoining smaller structures for the sorting department, beater rooms, rotary cooking department, pulp tankage department, machine shops, power house and miscellaneous structures. Raw material will be furnished from Leesburg plant of the company. The new mill is estimated to cost $500,000. Gilbert D. Leach is secretary and treasurer.

Georgia

SAVANNAH—The Western Paper Makers' Chemical Co., Kalamazoo, Mich., will remodel and improve the local plant of the Grecian-American Turpentine Co., recently acquired, for the establishment of a new branch works for rosin sizing and kindred production. The local plant will be operated in conjunction with other branches now located at Jacksonville and Pensacola, Fla. O. E. Scott is local manager.

PERRY—The Clinchfield Portland Cement Co., Kingsport, Tenn., has acquired the local cement mill and land of W. E. Culbert, and will use the property in connection with its proposed new plant in this district. Plans are under way for the initial buildings and it is expected to break ground at an early date. The plant will have an initial capacity of about 4,000 bbl. per day, and is estimated to cost in excess of $2,500,000, with machinery.

Idaho

KELLOGG—Frederick Tolson and associates have leased the property of the Eldorado Mining Co., near Kellogg, and plan for the construction of a new concentrating plant with initial capacity of about 10 tons per day; additional units will be installed at a later date. Air compressors and other surface plant equipment will also be installed.

LEWISTON—The City Controller will receive bids until Oct. 10 for filter plant equipment for the new municipal waterworks, comprising four filter units, with capacity of 1,500,000 gal. per day, and auxiliary equipment; also, for a complete water purification plant, with filter basins, mixing chamber, settling basins, etc. The Burns & McDonnell Engineering Co., Interstate Bldg., Kansas City, Mo., is engineer.

Illinois

CHICAGO—Philip Ruxton, Inc., 161 West Harrison St., manufacturer of printing inks, is taking bids on a general contract for the erection of a new 1-story plant, 100x103 ft., at 2111 Elston St., and will soon commence work. Clark & Walcott, 8 East Huron St., are architects. E. C. Andrews is vice-president.

Indiana

INDIANAPOLIS—John G. Broerse has commenced the erection of a new plant at 330 North Noble St., to be equipped for the manufacture of paints and kindred products. Operations will be commenced at an early date.

Kansas

CAMBRIDGE—The Empire Companies, Inc., Bartlesville, Okla., has commenced the construction of a new gas-compressing plant on local site, designed for an initial capacity of 40,000,000 cu.ft. per day. Four single-tandem gas engines, each with capacity of 485 hp. and auxiliary equipment will be installed.

Kentucky

LOUISVILLE—The Louisville Petroleum Refining Co. is perfecting plans for the construction of a new oil-refining plant with initial output of about 2,500 bbl. per day, estimated to cost close to $300,000, with machinery. W. M. Mitchell is president and general manager.

Louisiana

PLAQUEMINE—The Edward J. Gay Planting & Mfg. Co. has commenced the installation of additional machinery at its sugar-refining plant in Iberville Parish. The work will include new centrifugals, juice heaters and auxiliary equipment.

MONROE—The Magnolia Carbon Co., recently organized with a capital of $500,000, is perfecting plans for the construction of a new local carbon black and gasoline extraction plant. The works will consist of four main units, estimated to cost in excess of $500,000, with machinery, of which a list will be prepared at an early date. W. H. Price, Swartz, La., will act as construction engineer. W. L. Ethridge is secretary, in charge.

Maryland

HANCOCK—Work will be commenced on the installation of a new filtration plant at the municipal waterworks, with capacity of about 500,000 gal. per day. The J. B. Furguson Co., Hagerstown, Md., is engineer.

Michigan

CALUMET—The Seneca Copper Co. has plans under consideration for the installa-

tion of additional equipment at its No. 2 Gratiot property, including ore crushers, electric motors and other power equipment, bins, chutes, etc.

Montana

BUTTE—The Anaconda Copper Mining Co. has plans under way for the construction of an addition to its wire mill, 50x125 ft., estimated to cost approximately $80,000.

New Hampshire

NEWINGTON—The Atlantic Dyestuff Co., Portsmouth, N. H., is perfecting plans for the construction of a new addition to its local plant, estimated to cost about $70,000.

New Jersey

MILLVILLE—The Whitall-Tatum Co., manufacturer of glass bottles and containers, has commenced the construction of a new building at its plant, to replace a portion of the works destroyed by fire several months ago.

New York

NEW HARTFORD—The Campbell Refining Corp., 250 West 57th St., New York, refined oils, has purchased the former local plant of the New Hartford Canning Co., and will remodel and improve the structure for a new works.

NEW YORK—The Alexander Herz Co., 9 Barrow St., manufacture glassine envelopes and kindred specialties, has preliminary plans for the construction of a new 5-story plant, 200x275 ft., on site recently acquired on Walnut Ave., and purposes to proceed with the project at an early date. The company will occupy the larger portion of the structure with the remaining space to be used by affiliated interests. Alexander Herz is president.

TOTTENVILLE, S. I.—In addition to buildings now in course of construction at the plant of the Tottenville Copper Co., Arthur Kill Road and Bethel Ave., plans are being prepared for three additional structures, comprising a 1-story refinery, blast-furnace building and mechanical wash house. It is purposed to commence work on the new units at an early date. The structures will replace a former works destroyed by fire a number of months ago.

LOCKPORT—The Upson Co., manufacturer of composition wallboard products, has filed plans for the construction of a 1-story addition to its plant.

BROOKLYN—A chemical laboratory will be installed in the new James Madison High School, to be erected at Bedford Ave. and East 27th St., estimated to cost $3,100,000. The Board of Education, Park Ave. and 59th St., New York, is in charge; William H. Gompert, 171 Madison Ave., New York, is architect.

NEW YORK—The address of the National Gold Arsenic Corp., referred to in this column in issue of Sept. 10, is Room 2001, 25 West 43rd St. The company is arranging plans for a proposed plant in Georgia for calcium arsenate production, estimated to cost more than $300,000. L. P. Jubien is secretary.

North Carolina

CHARLOTTE—The Grasselli Chemical Co., Cleveland, O., is having plans drawn for the construction of an addition to its local plant, to be equipped as a mixing department, and as a laboratory, respectively.

WINSTON-SALEM—The Blue Ridge Mica Co. has plans in preparation for the construction of a new local plant in the vicinity of Sunnyside Ave., consisting of a number of plant units, estimated to cost approximately $250,000, with machinery.

Ohio

CONNEAUT—The Graham Clay Products Co., 518 Guardian Bldg., Cleveland, O., B. J. Graham, president and treasurer, has preliminary plans under way for the construction of a new local plant for the manufacture of tile and other clay products, estimated to cost approximately $100,000, including equipment.

NORTH AKRON—The International Lead Co., a subsidiary of the Anaconda Copper Mining Co., 25 Broadway, New York, N. Y., operating a local plant for the manufacture of zinc oxide, etc., is perfecting plans for the immediate construction of a new unit to consist of four buildings, estimated to cost approximately $500,000, including machinery. The extension has been designed to double the capacity of the present works, and is expected to be ready for operation early in the coming year.

Pennsylvania

STARRUCA—The Metropolitan Charcoal Co. has acquired the local plant of the Crossley Chemical Co., heretofore devoted to the manufacture of wood alcohol and acetate of lime, and will take immediate possession. The new owner purposes to make improvements in the plant and operate for the manufacture of various chemical products.

JOHNSONBURG—The Kistler Leather Co., Boston, Mass., has construction in progress on a new 1-story building at its local plant, 40x200 ft., estimated to cost approximately $30,000.

Tennessee

TRENTON—R. H. Patterson, Trenton, and L. P. Brown, Memphis, Tenn., have organized the Trenton Cotton Oil Co., with capital of $100,000, to take over and operate the former cottonseed oil mill of the American Cotton Oil Co., on local site, recently acquired for a consideration of about $100,000. Plans are being considered for extensions and improvements. Production will be commenced at an early date.

NASHVILLE—The Nashville Paper Stock Co. has preliminary plans for the rebuilding of the portion of its 4-story plant, recently destroyed by fire, with loss estimated at approximately $30,000.

Texas

EASTLAND—The Freeborn & Little Oil Co. is reported to have tentative plans under consideration for the construction of a new local carbon black plant, estimated to cost close to $100,000, including equipment.

MILDRED—The Humble Oil & Refining Co., Houston, Tex., has preliminary plans under consideration for the construction of a local gasoline-refining plant, estimated to cost in excess of $150,000, including equipment.

Virginia

GREEN SPRING—The Chesapeake & Ohio Railway Co., Roanoke, Va., will commence the construction of a new creosoting plant on local site for tie and other timber treatment. It is estimated to cost more than $75,000, with equipment. C. W. Johns is chief engineer.

West Virginia

KEYSER—The City Council has approved plans for the construction of a filtration plant in connection with a new waterworks system, for which bids will be called at an early date. A bond issue of $175,000 has been arranged.

NEW CUMBERLAND—In connection with the rebuilding of its local plant, recently destroyed by fire, the New Cumberland Glass Co. will increase the capacity for the manufacture of a general line of glass products, instead of chimneys exclusively, as heretofore. Erection will be commenced on a building 25x100 ft., and machinery installed at an early date. F. E. McElfresh is general manager.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

AMMONIA, ANHYDROUS, for ice plant. Santander, Spain. Purchase.—7720.

CAUSTIC SODA, 10,000 to 50,000 kilos, and chloride of lime, 10,000 kilos. Rotterdam, Netherlands. Agency—7703.

CHEMICALS, INDUSTRIAL. Porto Alegre, Brazil. Purchase and agency.—7699.

FERTLIZERS. Dublin, Ireland. Purchase and agency.—7686.

LITHOPONE, in 1-ton lots. Muttenz, Switzerland. Purchase.—7721.

PAINT, RADIUM, in bulk. Pretoria, South Africa. Purchase.—7687.

PAINT, VARNISH AND LACQUER. Stockholm, Sweden. Purchase.—7763.

PIGMENTS, varnish gums, white lead, and zinc white. Dublin, Ireland. Purchase.—7700.

New Companies

AMERICAN CHEMICAL PRODUCTS, INC., Newark, N. J.; chemicals and chemical byproducts; $50,000. Incorporators: James G. and Philip Parelli, and Douglas R. Todd, 810 Broad St., Newark. The last noted is representative.

KENTUCKY FIREBRICK CORP., Ashland, Ky.; firebrick and other refractories; $500,000. Incorporators: A. J. and A. L. Russell, both of Ashland.

LOOS & DILWORTH, INC., Philadelphia, Pa.; paints and varnishes; $5,000. J. R. Tompkins, Collingswood, N. J., treasurer and representative.

PEARL CHEMICAL PRODUCTS CO., 44 Franklin St., Providence, R. I., organized; chemicals and chemical byproducts. Charles S. Williams, 256 Rugby St., is head.

REVIEW CONSOLIDATED PETROLEUM CO., Los Angeles, Calif.; petroleum products; $300,000. Incorporators: J. N. Bessell, E. G. Lewis and William Ahrens. Representative: Paul E. Younkin, 919 Story Bldg., Los Angeles.

SUPERIOR SILICA CO., South Rockford, Mich.; operate silica properties; $300,000. Incorporators: F. B. Downs, A. T. Pryor and R. H. Goode, 2211 Dime Bank Bldg., Detroit.

HUNN-LETTON PAINT CO., Kansas City, Mo.; paints and varnishes; $50,000. Incorporators: L. A. Starr and W. B. Hunn, 4600 Warwick Blvd., Kansas City.

MONARCH LEATHER CO., Wilmington, Del.; leather products; $2,500,000. Representative: Corporation Trust Co. of America, du Pont Bldg., Wilmington.

NATE PARRIS CO., INC., El Dorado, Ark.; petroleum products; $750,000. Nathan E. Parris is president, and H. J. Parris secretary and treasurer, both of El Dorado.

SOUTHERN PACIFIC CORK MFG. & PRODUCTS CO., Los Angeles, Calif.; cork products; $10,000. Incorporators: Maurice Silberman and Joseph Sorokin. Representative: Thomas T. Robinson, 928 Merchants' National Bank Bldg., Los Angeles.

RED SEAL CHEMICAL CO., New York, N. Y.; chemicals and chemical byproducts; $10,000. Incorporators: A. and I. Milite, and C. V. Corcilli. Representative: Choate & Lee, 36 West 44th St., New York.

CORDOVA RUBBER CO., Pittsburgh, Pa.; being organized, to make application for a state charter Sept. 24; rubber products. Incorporators: Philip L. and Morris H. Drosnes, and James P. McCullough. Representative: Jacob Levin, 715-16 State Theater Bldg., Pittsburgh.

MINERALS REFINING CO., Orange, N. J.; operate a mineral refining plant; 1,000 shares of stock, no par value. Incorporators: Foster Bailey, Ernest S. Suffern and Elmer E. Dougherty, 64 South Essex Ave., Orange. The last noted is representative.

WESTERN MARYLAND OIL CO., Front Royal, Va.; petroleum products; $50,000. Incorporators: R. E. Herr and O. R. Bordon, both of Front Royal.

PERMANENT PAINTS, INC., New York, N. Y.; paints, varnishes, etc.; $25,000. Incorporators: N. O. and W. F. Whitehouse. Representative: J. J. Halpin, 46 Cedar St., New York.

SUPERIOR PLATE GLASS CORP., Pittsburgh, Pa.; glass products; $5,000 nominal. James R. Miller, Oliver Bldg., Pittsburgh, is treasurer and representative.

GOLDEN STAR OIL CO., San Francisco, Calif.; refined oil products; $250,000. Incorporators: J. M. Owsley, Louis Goldstone and Ernest J. Gilbert. Representative: Schlussel & Bloch, Phelan Bldg., San Francisco.

AMERICAN MINING & CONCENTRATING CORP., Philadelphia, Pa.; operate a concentrating plant for mineral production; $250,000. Representative: United States Corporation Co., Pennsylvania Bldg., Philadelphia.

PARLETT VARNISH CO., 3 West Lafayette Ave., Baltimore, Md.; varnish, stain, paints, etc.; $100,000. Incorporators: Ernest W. Parlett, Frederick R. Peddicord and Arthur E. Green.

MCKEESPORT LEAD MINING CO., LTD., McKeesport, Pa.; lead mining and refining; $2,000,000. Incorporators: Thomas J. Lewis, Frank S. Roderick and Dr. Joseph L. Conrad. Representative: Capital Trust Co. of Delaware, Dover, Del.

FISHER OIL CO., Los Angeles, Calif.; petroleum products; $3,000,000. Incorporators: Walter H. and Wayne H. Fisher, and R. F. Yerge. Representative: Joseph Musgrove, 820 Trust & Savings Building, Los Angeles.